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DO JUDGES MAKE OR DISCOVER LAW?

ZECHARIAH CHAFEE, JR.

Professor of Law, Harvard University Law School

(*Read April 25, 1947*)

In 1345 an English lawyer argued to the court, "I think you will do as others have done in the same case, or else we do not know what the law is." "It is the will of the Justices," said Judge Hillary. Chief Justice Stonore broke in: "No; law is that which is right."[1] This controversy between the two judges is still raging after six centuries. The problem phrased in modern terms is this: Exactly what part do judges play in the development of law? Many of the cases which come before American courts, especially appellate courts, turn on a question of law which is not answered by any plain language in the Constitution and the statutes or by any settled rule of case-law. There is a gap which the judges have to fill. They decide the case according to a legal rule announced for the first time, which they declare to be binding in this case and in future litigation raising a question of the same sort. Where do the judges get this newly proclaimed law? Do they make it themselves in somewhat the way legislators undoubtedly make a statutory rule? Or do they discover it, as Stonore thought, in a body of principles of justice? If so, the judicial process resembles the way Pythagoras discovered the rule that the square on the hypotenuse equals the sum of the squares on the other two sides.

This latter view that law is something outside the judges was widely spread through American legal thought in the formative period of the nation by the great influence of Blackstone, who says of the judges:[2]

> They are the depositaries of the laws; the living oracles, who must decide in all cases of doubt, and who are bound by an oath to decide according to the law of the land.

According to Blackstone judicial decisions are not the common law, but only "the principal and most authoritative evidence, that can be given, of the existence of such a custom as shall form a part of the common law." Judges come to know the law of the land "from experience and study; . . . and from being long personally accustomed to the judicial decisions of their predecessors." A judge is "sworn to determine, not according to his own private judgment, but according to the known laws and customs of the land; not delegated to pronounce a new law, but to maintain and expound the old one." According to this theory, when a new question is presented by the development of inventions and changes in business arrangements and in social conditions, the judge does not make a new rule to meet the new problem, but he derives the appropriate rule logically from pre-existing principles; "out of the Old Fields must spring and grow the new Corn."[3]

A twentieth-century version of this theory was maintained by my old teacher, Professor Beale:[4]

> Wherever . . . there is a political society, there must be some complete body of law, which shall cover every event there happening.

So when the Wrights launched their airplane at Kittyhawk, there was already in existence a law relating to airplanes and the aviator's right to fly over another man's land. The judge before whom the action of trespass came would merely have to discover what this law was.

When Blackstone's theory is pushed to such an inescapable conclusion, it becomes a bit disquieting. And so the contrary view of the other judge in 1345, that law is "the will of the Justices," refuses to stay down. It has been vigorously advocated by some of the most critical minds in the law. Bentham spoke contemptuously of "judge-made law."[5] Austin's insistence that all law is sanctioned expressly or tacitly by the sovereign naturally led him to include what he called "judiciary law" and to maintain that judges make this kind of law.[6]

[1] Langbridge's Case, Year Book of 19 Edward III, 375 (1345).

[2] Blackstone, William, *Commentaries* I. 69, Oxford, Clarendon Press, 2nd ed. 1766.

[3] 1 Coke Reports, To the Reader.

[4] Beale, Joseph H., *A selection of cases on the conflict of laws* III: 502, Cambridge, Harvard Law Review Assn., 1902.

[5] Austin, John, *Lectures on judisprudence* I: 242, London, John Murray, 5th ed. by R. Campbell, 1885. This edition includes notes by John Stuart Mill.

[6] II *ibid.* 621.

> A law made judicially is made on the occasion of a judicial decision. The direct or proper purpose of its immediate author is, the decision of the specific case to which the rule is applied, and not the establishment of the rule. Inasmuch as the grounds of the decision may serve as grounds of decision in future and similar cases, its author legislates substantially or in effect: And his decision is commonly determined (not only by a consideration of the case before him, but) by a consideration of the effect which the grounds of his decision may produce as a general law or rule. . . . He legislates *as properly judging*. . . .

For Austin, then, a judicial decision establishes a new principle. It does not come from outside the judges. "A law (or rule of law) made by judicial decisions, exists nowhere in a general or abstract form."[7] Austin ridiculed Blackstone[8] for accepting "the childish fiction employed by our judges, that judiciary or common law is not made by them, but is a miraculous something made by nobody, existing, I suppose, from eternity, and merely *declared* from time to time by the judges." Yet Austin did not share Bentham's low estimate of the law made by judges, but praised it as far better made than statute-law.[9]

Austin was followed by Sir Henry Maine,[10] and in America by John Chipman Gray[11] and Justice Holmes. Poking fun at Blackstone, Holmes said:[12]

> The common law is not a brooding omnipresence in the sky, but the articulate voice of some sovereign or quasi-sovereign that can be identified. . . .

This theory that judges make law as well as legislators, although in a somewhat different way, has been steadily gaining ground and bids fair to become the orthodox view of our time just as Blackstone's theory was orthodox in nineteenth-century America.

To describe the difference between the two theories pictorially: For Chief Justice Stonore and Blackstone and Beale, the law is like a great partially explored continent which is always there and which the judges are gradually mapping out by their decisions. A particular judge's personality does play a part, but it does not affect the real rules of the law. It merely influences the accuracy with which his written opinion describes this law outside himself, just as one mapmaker may explore farther than another or record what he sees with greater skill. For example, a judge may confuse two legal doctrines that are really distinct, just as early voyagers along the New England Coast confused the summits of Mount Desert with the Camden Hills. But these mountains remained many miles apart, whatever the maps said, and the law that exists somewhere or other stays the same whatever judges do. On the other hand, if judges make law as Judge Hillary and Austin and Holmes maintained, then the law is like a skyscraper under construction and never finished. The judges gradually put up some beams as they wish; the legislators gradually put up other beams as they wish. All law is built by human beings including judges.

This theoretical controversy may sound like nothing more than a source of speculative pleasure for lawyers in their off hours, but actually it has important practical implications. In at least five situations the choice between the two theories has considerable bearing on the outcome of litigation.

1. THE EFFECT OF AN OVERRULED DECISION

Sometimes a particular rule of law which has been recognized by a decision or a series of decisions gets to be regarded as so undesirable that the court overrules it and announces that the law is just the opposite from what the judges used to say. This has happened frequently in the United States Supreme Court since Mr. Roosevelt's abortive attempt to increase its size in 1937. Well-known examples of such overruling decisions upheld minimum wage laws,[13] and prevented schools from expelling children because their consciences would not allow them to salute the flag.[14]

These judicial somersaults are an exception to the principle of *stare decisis,* which means the strong obligation of judges, as Blackstone says:[15]

> to abide by former precedents, where the same points come again in litigation: as well to keep the scale of justice even and steady, and not liable to waver with every new judge's opinion; as also be-

[7] II *ibid.* 622.
[8] II *ibid.* 634.
[9] I *ibid.* 218–219.
[10] Maine, Henry S., *Ancient law,* 31–33, London, John Murray, 1st ed. 1861.
[11] Gray, John Chipman, *Nature and sources of the law,* 218–240, N. Y., Macmillan, 2d. ed. 1931.
[12] Dissenting in *Southern Pacific Company* v. *Jensen,* 244 United States Reports 205 at 222 (1917).
[13] *West Coast Hotel Co.* v. *Parrish,* 300 United States Reports 379 (1937).
[14] *West Virginia State Board of Education* v. *Barnette,* 319 United States Reports 624 (1943).
[15] Blackstone, William, *Commentaries* I: 69, Oxford, Clarendon Press, 2nd ed. 1766.

cause the law in that case being solemnly declared and determined, what before was uncertain, and perhaps indifferent, is now become a permanent rule, which it is not in the breast of any subsquent judge to alter or vary from according to his private sentiments. . . .

This adherence to precedents enables men to shape their transactions and behavior in reliance on the recognized rule of law. Thus *stare decisis* conduces to stability and certainty in the law. The mere fact that a long-established rule is not now thought to be "that which is right" must not automatically lead to its destruction at the cost of unsettling the structure of property or business relations. Still, bad judicial mistakes have occurred and standards of justice and social desirability do not remain the same forever. The perpetuation of a bad rule may become a greater evil than uncertainty and instability. Hence there needs to be some judicial power to overrule precedents, although the court which is asked to do so is always faced with a difficult choice of evils.

Now comes the specific situation where it does make considerable difference whether judges make or discover law. Suppose that Decision No. 1 in 1935, holding a certain transaction between A and B valid, is overruled in 1940 by Decision No. 2 which invalidates a similar transaction between C and D. Fortunately, the second case arose out of acts in 1934 (before the earlier decision), so that the overruling court did not have to worry about upsetting any reliance by C and D upon the 1935 decision. Is a transaction between X and Y in 1939, during the interval between the overruled case and the overruling case, valid or invalid? Assume that this question comes before the court as Case No. 3 in 1947. Shall the court decide that the 1939 transaction was governed by the 1935 decision, which was then all there was, or by the subsequent 1940 decision, which was still in the womb of the future? No doubt, the 1940 rule is now firmly believed to be better, but was it law *before* the court announced it? In short, was the law in 1939 *made* by the judges in 1935 or *discovered* by the judges in 1940?

According to Blackstone the 1939 transaction was invalid because the 1940 decision to that effect declares what always was the law. It is the task of judges to discover the law of the land, which obviously cannot be two diametrically opposed rules. Only one of the decisions can represent the everlasting law, and this must be Decision No. 2. The earlier decision goes into the discard. This is the way Blackstone explains the effect of overruling a decision:[16]

> But even in such cases the subsequent judges do not pretend to make a new law, but to vindicate the old one from misrepresentation. For if it be found that the former decision is manifestly absurd or unjust, it is declared, not that such a sentence was *bad law*, but that it was *not law*. . . .

In the first decision, the judges made a mistake in their map. In the second decision, they rubbed out the wrong lines and made some new lines which located the mountains correctly. Still, the mountains were in the same place all the time.

Under the skyscraper theory, however, each decision is law while it is in force. The first decision was like a beam of the skyscraper which has now been taken down and a new beam erected differently. Nevertheless, it was part of the law as long as it was up. It resembled a statute which has now been amended or repealed. Intermediate transactions were governed by the law at the time, whether statutory or judge-made, regardless of a subsequent change.

So far we have been speculating about law during the interval, but courts have had to consider the question many times. Let me take two striking examples.

The Legal Tender Acts passed during the Civil War compelled creditors to accept the amount of a debt in greenbacks even though the debt was contracted before the legislation and the parties had expected that only gold and silver would be a proper payment. In December 1869 the Supreme Court held these statutes unconstitutional as to pre-existing debts. In December 1870 the Court overruled itself and declared the Legal Tender Acts valid as to all debts. Between these two decisions, on March 1, 1870, a mortgage for $7,000 became due, which had been put on New York land before the Civil War. The owner of the premises, who had bought the land from the original mortgagor, tendered $7,000 in greenbacks as the statutes allowed. The mortgagee demanded instead $7,000 in gold, which was then at a considerable premium, or else a larger amount in greenbacks equivalent to the value of the gold. The mortgagee was asking for just what the Supreme Court, three months earlier, had declared he ought to have. The landowner refused to raise his tender, so the mortgagee sued to foreclose. Under New York law, if he had refused a proper

[16] *Ibid.* 70.

tender, that would forfeit his rights in the land and leave him only a personal claim against the original mortgagor, who was presumably not worth suing. The case came on for argument in the highest court of New York in 1873, long after the Supreme Court had reversed itself. The only question was whether the tender was proper. It was improper under the decision three months earlier, and it was proper under the overruling decision nine months later. By which should its validity be tested?[17]

Here the theoretical controversy became relevant. By the unmapped continent theory, the Legal Tender Acts were always constitutional. The Supreme Court in 1869 simply made a mistake which had no bearing on the true law in March 1870. Consequently the tender was proper and the mortgagee lost all his rights against the land. But by the skyscraper theory, the Legal Tender Acts were unconstitutional for a whole year and did not become valid until December 1870. The Supreme Court decision of December 1869 was law in March 1870, so that the tender of depreciated greenbacks did not correspond with the law on that day. Therefore, the mortgagee's lien remained alive.

The New York court did enforce the mortgage, relying considerably on the skyscraper theory. Judge Andrews said:

> The plaintiff had a right to repose upon the decision of the highest judicial tribunal in the land. It was, as applied to the relations between these parties and to this case, the law, and not the mere evidence of the law.

It is worth noting, however, that the mortgagee finally collected only $7,000 in greenbacks, and not the $7,000 in gold to which he was entitled by the alleged "law" on March 1, 1870, when the debt ought to have been paid.

A good many cases in state courts similarly refuse to let a transaction which was lawful under previous decisions be upset or punished because of a later overruling decision. Nevertheless, it would be hasty to infer that the skyscraper theory is solidly esablished. For one thing, there are some state cases the other way. Even the New York courts are capable of adopting the unmapped continent theory on occasion, as the next example shows.

In 1928 the United States Supreme Court held that royalties from copyrights were not subject to a state income tax.[18] In 1932 this decision was overruled.[19] During the three intervening years (1929, 1930, 1931) Elmer Rice, a distinguished dramatist living in New York, had received large royalties from his plays on which he paid no New York income taxes. After the overruling decision, the New York authorities demanded three years' back taxes from Mr. Rice on those royalties. Did he have to pay? If the overruled decision was law while it lasted, as the skyscraper theory says, then there was no law taxing the royalties between 1928 and 1932. By the unmapped continent theory, the tax was constitutional all the time. The Supreme Court simply had a temporary aberration. And so it worked out. The New York courts made Mr. Rice pay the back taxes with interest at six per cent for being late.[20]

At this point it will be helpful to forget all about the Blackstonian theory and the Austinian theory for a few minutes, and approach these two New York cases with an entirely fresh question in mind: Was the actual outcome of each case fairer to all concerned than if exactly the opposite result had been reached? Let us stop asking whether the Supreme Court judges made or discovered law and ask, instead, whether the New York judges did justice?

They did it in the mortgage case, I think everybody will agree. The mortgagee got back his loan of $7,000 out of the land in accordance with his original bargain, except that he was paid with depreciated greenbacks, but in that respect he was no worse off than other creditors. Therefore, he was treated fairly. And so was the landowner. Although he lost the case, that simply knocked out his technical defense. So far as all matters of substance were concerned, he was as well off as most other owners of mortgaged land who cannot escape payment forever. What he really wanted all along was to pay in greenbacks, and he did. Thus he got the eventual benefit of the Supreme Court's later and right decision that the Legal Tender Acts are constitutional. Hence the landowner could not justly complain of the outcome. But if the

[17] *Harris* v. *Jex*, 55 New York Reports 421 (1874).

[18] *Long* v. *Rockwood*, 277 United States Reports 142 (1928).

[19] *Fox Film Corp.* v. *Doyal*, 286 *ibid.* 123 (1932). Although the royalties were earned after *Long* v. *Rockwood*, the point that that case was law *pro tem.* was not raised.

[20] *People ex rel. Rice* v. *Graves*, 242 New York Appellate Division Reports 128 (1934), affirmed by memorandum, 270 New York Reports 498 (1936). The Supreme Court denied review in 298 United States Reports 683 (1936).

New York court had gone the other way, then the mortgagee would certainly have had solid reasons for indignation. He would have lost his entire loan on a technicality without any fault on his part. Merely because the highest court in the nation had misled him into demanding $7,000 in gold, he would not have recovered even greenbacks and the landowner would have received an undeserved windfall of $7,000. A blot on justice, if ever there was one!

The foregoing discussion enables us to block out tentatively a technique for handling the problem of intervening transactions. The court is forced to choose between two more or less unsatisfactory courses. Is it better to judge the intervening transaction by an old rule of law which is now seen to be unsound or absurd, for the sake of protecting the party who relied on the earlier decision? Or is it better to give the other party and the public the benefit of the sounder rule, at the cost of disappointing reasonable expectations? The court has to ask whether the amount and nature of the reliance on the old decision outweigh the superior merits of the new decision. The balance will tip one way or the other according to the relative weight of these opposing considerations of justice. In the New York mortgage case the court fortunately found it possible to take care of both factors. The mortgagee's reliance on the First Legal Tender Case was adequately protected by giving it a limited effect so as to keep the mortgage alive, but the desirable principle of the Second Legal Tender Case was applied in the end when the landowner paid what was owed in greenbacks.

Now look at the New York tax case with the help of the proposed technique. Many people will think that the result was very unfair to Mr. Rice. Leave out the six per cent interest for the time being, and consider only the amount of the back taxes. Here it was much harder to find a right way out than in the mortgage case, because no half-way measure was available. The court could not possibly take care of both sides. Either the state would lose that much revenue which was badly needed for expenses, or Mr. Rice would pay that much money for what he reasonably thought was over and done with.

Let us weigh the opposing factors. First, if the legal rules of the two Supreme Court decisions are compared solely on their merits, the earlier decision deserves to be completely discarded. It now seems very artificial to exempt an author's royalties from state taxation merely because they come from a federal source. The federal government is perhaps injured if New York taxes United States bonds, but it is not a whit worse off because New York taxes copyrights. If the burdens of the state are to be distributed according to the ability of the taxpayers to bear them, a man who gets $50,000 from writing plays should contribute as much as a man who gets $50,000 from writing life insurance. Mr. Rice ought to pull his weight in the boat.

Next, the reliance element here is weaker than in some other situations. The application of the overruling sound decision will not forfeit a large investment, as in the mortgage case. It will not upset a land title acquired on the faith of the old unsound decision. Mr. Rice simply has to turn over in a lump after 1932 the money he would have given up year by year if the Supreme Court had taken the right view throughout. The opposite result will let him keep a rather absurd windfall. So long as Mr. Rice still has the money which he saved because of the first decision, he does not suffer any serious hardship from paying it late. But where the shoe pinches is that Mr. Rice may have spent the money. Many of us know how tough it is to dig up cash in bad times in order to pay taxes on income received in good times. One purpose of the Ruml Plan was to lessen that hardship. And the bigger the tax-rate, the bigger the blow. This special point perhaps justifies the outcome of the Rice case. At the worst, New York took only three per cent of Mr. Rice's old royalties. We can hope, then, that it was not very burdensome for him to find the money for these back taxes.

Suppose, however, that the principle of the *Rice* case were applied to impose back federal income taxes and take thirty or forty or fifty per cent of the earnings of former years. The effect would be ruinous to many taxpayers. For example, a series of Supreme Court decisions held that the United States could not tax the salaries of state judges and professors in state universities. In 1939 the Supreme Court overruled these decisions,[21] and such state officials are taxed like anybody else on their current salaries. It is significant, however, that Congress expressly refrained from opening up their returns for previous years so as to tax back state salaries.[22] That would have been grossly unjust.

[21] *Graves* v. *New York ex rel. O'Keefe*, 306 United States Reports 466 (1939).

[22] 53 Statutes at Large 575 (1939), § 201.

With regard to the six per cent interest, the reliance element was very strong. Mr. Rice eventually paid all the taxes that he would have paid currently if he had not been honestly misled. At the time of his annual state returns, the United States Supreme Court and the state tax regulations told him not to pay any tax on the royalties. Therefore, they and not he caused the delay in payment. The amount of the interest was considerable to Mr. Rice and small to the state. The court's argument that he had the use of the money does not correspond to life's realities. In my opinion, it was outrageous for the New York court to make Mr. Rice pay this interest. Not content with their pound of flesh, the state tax authorities got every drop of blood too.

How can a court extract a decaying decision painlessly? That is the basic problem in this whole class of cases. No matter if the judges are Austinians or Blackstonians, it is difficult to change an unsound legal rule without causing harmful social dislocation. Whether the old undesirable decision made bad law or discovered the eternal law incorrectly, it probably created expectations and shaped transactions during subsequent years. When those expectations and transactions get before a court, they are likely to be upset by a different and better decision, provided that it operates retrospectively in the way courts usually do. If the judges make law for the past, it is just as unsettling as drawing a new map of something outside themselves which was law all the time. The real trouble, as I shall soon show, is caused by the fact that judgments ordinarily work backwards.

The dislocating consequences of overruling a decision were amusingly set forth by Judge Jeremiah Black in 1855. A land title, which was valid according to numerous decisions before its acquisition, was overturned by a subsequent contrary decision by the majority of the highest court of Pennsylvania. Judge Black vigorously dissented:[23]

> The judgment now about to be given, is one of "death's doings." No one can doubt that if Judge Gibson and Judge Coulter had lived, the plaintiff could not have been thus deprived of his property; and thousands of other men would have been saved from the imminent danger to which they are now exposed of losing the homes they have labored and paid for. But they are dead; and the law which should have protected those sacred rights has died with them. It is a melancholy reflection, that the property of a citizen should be held by a tenure so frail. But "new lords, new laws" is the order of the day. Hereafter if any man be offered a title which the Supreme Court has decided to be good, let him not buy if the Judges who made the decision are dead; if they are living let him get an insurance on their lives; for ye know not what a day or an hour may bring forth.
>
> The majority of this Court changes on the average once every nine years, without counting the chances of death and resignation. If each new set of Judges shall consider themselves at liberty to overthrow the doctrines of their predecessors, our system of jurisprudence (if system it can be called) would be the most fickle, uncertain and vicious that the civilized world ever saw. A French constitution, or a South American republic, or a Mexican administration would be an immortal thing in comparison to the short-lived principles of Pennsylvania law. The rules of property which ought to be as steadfast as the hills, will become as unstable as the waves.

Yet it may be very difficult to avoid these dire consequences if the court is ever to get rid of a bad rule of case-law. Whatever the nature of judicial action, it is different from legislative action. Even if judges make law, they do not make it like legislators. A statute almost always makes law for the future and lets past transactions stand untouched;[24] but a judicial decision almost always operates retrospectively because it lays down a legal principle which governs the litigated dispute in addition to similar cases in future.[25] In an action for damages, the court is forced to pass on the legal consequences of acts which took place months or even years before the trial. In a criminal prosecution, the judges may have to determine whether the past conduct of an accused person should be regarded as a crime at common law. This retroactive operation of "judge-made law" was bitterly attacked by Jeremy Bentham in language which is equally condemnatory of the law which judges profess to discover after the event:[26]

> It is the judges (as we have seen) that make the common law. Do you know how they make it? Just as a man makes laws for his dog. When your dog does anything you want to break him of, you

[23] *Hole* v. *Rittenhouse*, 25 Pennsylvania Reports 491 (1855). The dissenting opinion quoted in the text is reported in 2 Philadelphia Reports 411, at 417–418.

[24] See Smead, Elmer E., The rule against retroactive legislation: a basic principle of jurisprudence, *Minn. Law Rev.* **20**: 775, 1936.

[25] See the excellent differentiation between statute and "judiciary law" in Austin, *loc. cit supra* note 6, and 622–659, *passim*.

[26] Bentham, "Truth versus Ashhurst" (written in 1792, published in 1823), reprinted in *Works* V: 235, Edinburgh, William Tait, ed. Bowring, 1843.

wait till he does it, and then beat him for it. This is the way you make laws for your dog: and this is the way the judges make law for you and me. They won't tell a man beforehand what it is he *should not do*—they won't so much as allow of his being told: they lie by till he has done something which they say he should not *have done*, and then they hang him for it.

Nevertheless, there is usually no other way in which judges can decide a case except by operating backward. Occasionally a judge merely forbids further acts by an injunction, but for the most part litigation necessarily involves the past. If, before the parties acted, their rights and duties were not plainly stated by a statute or a decision, then the law applicable to their acts has to be announced for the first time at some later date. There is no escape from this.

This difference between the legislative process and the judicial process becomes very significant when an old decision ought to be put out of the way. If this can be done through passing a statute, no serious social dislocation results; the new statutory rule will not have any effect upon previous conduct shaped by the old decision. Still, it is often impossible or impracticable to get rid of a bad decision through legislation. Sometimes only a few people are affected by it, and the legislature will not be stirred up to take action. Or a corrective statute may be extremely hard to draft and nobody gets round to it. And it is particularly important to remember that a statute will do no good if the objectionable old decision turned on a question of constitutionality. For example, Congress was powerless to get rid of the First Legal Tender Case or the 1928 decision exempting copyright royalties from state income taxes. In such situations, an amendment of the United States Constitution was the only alternative to an overruling decision. History shows how cumbrous it is to get a curative amendment adopted. Twenty-one years were required to supersede the unfortunate income tax decision of 1895[27] by the Sixteenth Amendment. The Child Labor Amendment, designed to get rid of a Supreme Court decision which aroused immense indignation,[28] failed in the state legislatures because of prophecies of terrible disasters, none of which have occurred since the simple and direct method of overruling the old case[29] accomplished the same result as the Amendment. Whenever the overruling process seems the only practicable way to get rid of a bad decision, the price for this reform is likely to be paid by numerous persons who shaped their transactions in reliance on the undesirable rule.

Therefore when a court is strongly impelled to overrule an old case, it usually has to ask itself whether it is willing to make the litigants and other persons similarly situated pay that price. John Doe may have to suffer for the Commonwealth's sake, but it is tough on John Doe.

Nevertheless, the New York mortgage case proves that it is occasionally possible for courts to announce a new rule and yet mitigate its retroactive effects somewhat for the sake of the reliance element. This is easiest whenever (as I have hitherto assumed) the overruling decision involves conduct *before* the overruled decision. That was the situation in the Second Legal Tender Case. Then courts can make the new rule operate backwards on the parties to that very case, but not on persons who engaged in intervening transactions. These other persons can be given the benefit of the old rule to the extent of their reasonable expectations. This solution gets rid of a bad decision without unjust dislocation.

Does it make any serious difference to such a solution whether judges make or discover law? Courts talk as if it did. When they want to avoid upsetting intervening transactions, they are likely to indorse the skyscraper theory; and when they care more about thoroughly uprooting the old bad decision, they are likely to say that the good later decision discovers what always was the law. Still, it is possible to solve the practical problem wisely in a given case without committing oneself to either theory.

For example, we can reach the just result of the New York mortgage case under the unmapped continent theory. Although the true law on March 1, 1870, was what the Supreme Court later declared it to be and the mortgagee was not really entitled to demand gold, still the First Legal Tender Case misled him into thinking that he could properly refuse greenbacks. So the New York court recognized his fair claim for relief from his honest mistake of law. No doubt, there is a maxim that every man is presumed to know the law, but he ought not to be presumed to know it better than the majority of the United States Su-

[27] *Pollock* v. *Farmers' Loan & Trust Co.*, 157 United States Reports 429, 158 United States Reports 601 (1895).

[28] *Hammer* v. *Dagenhart*, 247 United States Reports 251 (1918).

[29] *United States* v. *Darby*, 312 United States Reports 100 at 116 (1941).

preme Court. It would have been very harsh to make the mortgagee forfeit all his rights in the land for going wrong in such good company. There are many parallel situations where parties enter an important transaction in honest reliance upon apparent lawful authority and their transaction is not upset although the supposed lawfulness was actually lacking. For instance, a girl is married at her father's summer residence in Maine by the minister from their winter home in another state. He neglected to obtain a special permit to perform marriages in Maine, but the young couple firmly believe that they were lawfully married and act accordingly. Although the clergyman was behaving unlawfully, the marriage is valid nonetheless. The consequences of a refusal to give relief against the mistake of law would be appalling. The reasoning of the New York judges in the mortgage case rested partly on this ground as well as upon the skyscraper theory.

Although the skyscraper theory has received a good deal of judicial support in connection with this problem of the retroactive effect of an overruling decision, it seems to me a wooden and unsatisfactory solution of the problem. A more flexible and critical approach is needed. The skyscraper theory does not ask whether the new rule may be so greatly superior as to outweigh reliance on the old rule. Indeed it does not even bother to inquire into the quantity and quality of the reliance. It is enough that the transaction took place after the first decision. Then that decision governs even when the parties were ignorant of it or would have acted as they did anyway.[30]

I have not yet spoken of the situation which causes the most trouble. This is when the first opportunity to overrule a bad decision arises in a case involving a transaction *after* that decision and relying upon it. That is likely to happen unless the bad decision is overruled soon, for events before its date cease to come before the courts as the years go by.

Assume a Supreme Court decision in 1935 that a certain kind of business agreement does not violate the Sherman Act. In reliance on this, such an agreement is made in 1940. The parties to it are prosecuted under the Sherman Act in 1945. By this time most of the Justices are convinced that this sort of agreement is a crime in restraint of trade and very injurious to the public. How can they put their new view into effect without defeating reasonable expectations? Here an overruling decision must operate retroactively and upset the intervening transactions. The only way to protect these transactions is to refuse to overrule; that prolongs the old undesirable doctrine and injures the public. In such a dilemma, neither the skyscraper theory nor the unmapped continent theory is of much help. One way out is for the Court to apply the old rule and at the same time denounce it vigorously in the hope that nobody will rely on it again.[31] But this is not the place to discuss the perplexities of the situation.

To summarize this problem as to the effect of an overruling decision upon intermediate transactions. In some situations the skyscraper theory will achieve a just result, and in others the unmapped continent theory. Yet the sound criterion for decision lies outside both theories. The real question is which is more important—the protection of reliance on an old legal rule or the enforcement of a new and better legal rule. It is a choice between certainty and progress.

2. THE EFFECT OF DECISIONS OF STATE COURTS UPON UNITED STATES COURTS

In addition to the Supreme Court, the Constitution establishes a system of lower United States courts to sit in the various states. Besides handling prosecutions for federal crimes and issues arising out of the Constitution, Acts of Congress, and treaties, these United States courts also have much litigation of the sort which comes before state courts. Notably, the Constitution authorizes them to decide "all Cases, in Law and Equity, . . . between Citizens of different States. . . ." The framers thought that it was undesirable to leave the trial of such controversies solely to the state courts because they might discriminate against outsiders. This power to try non-federal questions is commonly called the diversity jurisdiction.

Soon after the First Congress convened, it set about establishing lower United States courts. The question immediately arose—by what law should these courts decide the cases before them? Consequently the Judiciary Act of 1789 pro-

[30] See, for example, *State* v. *Longino*, 109 Mississippi Reports 125 (1915). I disagree with the approval of this case in Note *Harv. Law Rev.* **29**: 80, 1915.

[31] *Great Northern Railway Co.* v. *Sunburst Oil & Refining Co.*, 287 United States Reports 358 (1932). See Note, "Prospective operation of decisions holding statutes unconstitutional on overruling prior decisions," *Harv. Law Rev.* **60**: 437, 1947.

vided:[32] "That the laws of the several states . . . shall be regarded as rules of decision in trials at common law in the courts of the United States in cases where they apply." Everybody has agreed that state statutes are "laws" within this clause, but how about state decisions? Are they "laws" too, which federal judges must follow regardless of their own views? Are they free to discover the common law in that which is right, or must they accept the will of the state judges as the law?

This very practical problem came before the Supreme Court in 1842 in the famous case of *Swift* v. *Tyson*.[33] A United States court sitting in New York City had a question about a bill of exchange drawn in Maine, as to which the New York state courts had adopted a view which differed from that prevailing in many other parts of the commercial world. Justice Story, who strongly disliked the New York view, held that the United States judges could discover the commercial law for themselves and find it to be just opposite from what the state judges had incorrectly said about it. By this rightly discovered law the plaintiff won the case although he would probably have lost in the state courts. Story rested squarely on the Blackstonian theory:

> In the ordinary use of language it will hardly be contended that the decisions of Courts constitute laws. They are, at most, only evidence of what the laws are; and are not of themselves laws. They are often reexamined, reversed, and qualified by the Courts themselves, whenever they are found to be either defective, or ill-founded, or otherwise incorrect. The laws of a state are more usually understood to mean the rules and enactments promulgated by the legislative authority thereof, or long established local customs having the force of laws.

Thus Story thought that the state judges' mapping of the undiscovered continent was wrong, and made a new map which he regarded as right. He stressed its correspondence with the maps made in many jurisdictions where commercial paper circulates.

> The law respecting Negotiable Instruments may be truly declared in the language of Cicero . . . to be in a great measure, not the law of a single country only, but of the commercial world. "There shall not be one law at Rome and another at Athens, one law today and another tomorrow, but among all peoples and at all times one and the same law shall obtain."

Swift v. *Tyson* was followed for decades by the United States courts in hundreds of cases. It was recognized, however, that state decisions ought to prevail as to matters of local importance like land law. A distinction was accordingly drawn between such local law and "general law," for which the United States courts were free to discover the rules which they thought right. The category of general law was gradually extended from commercial paper to include all sorts of legal issues, such as the liability of employers for accidents to their workmen and finally to the question whether a single taxicab company could possess the exclusive right to serve travelers at a railroad station.[34] Consequently, two different sets of legal rules prevailed in a given state over great areas of the law, depending on whether the litigation got before a state court or a federal court.

As might be expected, the doctrine was attacked by the leading advocates of the skyscraper theory. John Chipman Gray wrote:[35]

> Among the causes which led to the decision in *Swift* v. *Tyson*, the chief seems to have been the character and position of Judge Story. He was then by far the oldest judge in commission on the bench; he was a man of great learning, and of reputation for learning greater even than the learning itself; he was occupied at the time in writing a book on bills of exchange, which would, of itself, lead him to dogmatize on the subject; he had had great success in extending the jurisdiction of the Admiralty; he was fond of glittering generalities; and he was possessed by a restless vanity.

The Austinian views of Justice Holmes naturally made him a severe critic of Story's doctrine. Again and again he assailed it in dissenting opinions. For example, in the taxicab case already mentioned, he spoke of the fallacy of Story's treatment of the common law as a unit through the English-speaking world, or at least as a "common law of the United States":[36]

> If there were such a transcendental body of law outside of any particular State but obligatory within it unless and until changed by statute, the Courts of the United States might be right in using their independent judgment as to what it was. But there is no such body of law. The fallacy and illusion that I think exist consist in supposing that there is this

[32] 1 Statutes at Large 92 (1789), § 34. This is now 28 United States Code § 725.

[33] 16 Peters Reports 1 (1842).

[34] *Black and White Taxicab Co.* v. *Brown and Yellow Taxicab Co.*, 276 United States Reports 518 (1928).

[35] Gray, John Chipman, *Nature and sources of the law*, 253, N. Y., Macmillan, 2d ed. 1931.

[36] *Supra* note 34, at 533–534.

outside thing to be found. Law is a word used with different meanings, but law in the sense in which courts speak of it today does not exist without some definite authority behind it. The common law so far as it is enforced in a State, whether called common law or not, is not the common law generally but the law of that State existing by the authority of that State without regard to what it may have been in England or anywhere else.

Meanwhile, *Swift* v. *Tyson* was undermined on another side by the historical researches of Mr. Charles Warren.[37] He dug up the memoranda of the Senators who drafted the Judiciary Act, in the attic and cellar of the Capitol under heaps of miscellaneous papers, and came to the conclusion that the framers of this legislation intended "the laws of the several states" to include state decisions. Consequently, in so far as the minds of these few men count, Story misinterpreted the Act of Congress when he limited "laws" to statutes. My own feeling is that Mr. Warren proves too much, but his conclusions had much influence on the Supreme Court.

After Holmes was dead his ideas prevailed. In 1938 the Supreme Court decided *Erie Railroad Co.* v. *Tompkins,*[38] which involved an accident to a man walking on the railroad right of way in Pennsylvania. The Court insisted that the lower United States court must follow Pennsylvania state decisions, which happened to be different from the federal judges' view of the general common law. Justice Brandeis said:

> Except in matters governed by the Federal Constitution or by Acts of Congress, the law to be applied in any case is the law of the State. And whether the law of the State shall be declared by its Legislature in a statute or by its highest court in a decision is not a matter of federal concern. There is no federal general common law. Congress has no power to declare substantive rules of common law applicable in a State whether they be local in their nature or "general," be they commercial law or a part of the law of torts.

Instead of merely holding that the Judiciary Act, when correctly understood, obliged federal courts to follow state decisions, Brandeis even said that the Constitution forbade them to do anything else. In short, the United States Supreme Court had been violating the United States Constitution at frequent intervals for ninety-six years. Although this comic feature of the *Erie Railroad* decision is probably no longer accepted, the decision itself has completely superseded Story's doctrine. The obligation of federal courts to follow the decisions of state courts has been steadily strengthened. If the highest state court has not passed on the question, but some inferior state judge has done so, then the United States court must follow him. For example, federal judges in Chicago can no longer take their views of the common law from the magnificent opinions of Judge Learned Hand, but must accept the decision of a single Illinois trial judge who perhaps holds office because of his loyalty to the local machine. The new doctrine, of course, does not apply to the interpretation of Acts of Congress or to questions expressly entrusted to the federal government by the Constitution, but it governs a multitude of transactions which cuts across state lines. In this particular problem, the view that law is the will of the state judges has now become the orthodox theory of the Supreme Court.

Here again, I think that the answer to the practical question really depends on considerations of policy rather than on the choice between the unmapped continent theory and the skyscraper theory. No matter which theory of the nature of law one prefers, it would be possible to agree with either *Swift* v. *Tyson* or the *Erie Railroad* case. It is easier to support *Swift* v. *Tyson* on the Blackstonian theory, but a court adopting the Austinian theory could say that when the Constitution entrusted litigation between citizens of different states to the United States courts, it impliedly gave those courts power to make the law on which their decisions should be based. Therefore, within the United States courts, law is the will of the United States judges rather than the will of state judges. That proposition certainly holds for the Austinians when the United States courts decide federal questions, and it would not be absurd to extend it to all cases entrusted by the Constitution to United States judges. The *Erie Railroad* case, on the other hand, does result more naturally from the Austinian view, but the Blackstonians could say that on common law questions the federal judges must let state judges discover rules of law. They must use the map drawn by the state judges, just as a lower judge always has to get his map from the highest court of his jurisdiction.

What then is the issue of policy which really underlies this practical question? Why did the Supreme Court decide it one way a century ago

[37] Warren, Charles, New light on the history of the Federal Judiciary Act of 1789, *Harv Law Rev.* **37**: 49 at 81–90, 1923.

[38] 304 United States Reports 64 at 78 (1938).

and exactly the opposite way in our own time? The true choice, I think, depends on the relative importance attached to uniformity within a single state as against uniformity within the nation.

In Story's time, uniformity of the common law regardless of state lines was a cherished ideal. For example, seventeen years before *Swift* v. *Tyson*, in 1825 when the American Colonization Society ruled Liberia, it promulgated the first Liberian Constitution, said to have been written by Professor Simon Greenleaf. Article VI provided:[39]

> The common law, as in force and modified in the United States, and applicable to the situation of the People, shall be in force in the Settlement.

Not the common law of Maryland, where the Society was incorporated, or of any other state, but the common law of the United States. Furthermore, "The common law and usages of the courts of Great Britain and the United States" were by the Society's statute "to regulate all judicial proceedings."[40]

Furthermore, Story and the men of his time thought that this ideal might be attained through the influence of the United States courts upon state judges. No doubt, the unwritten law of one state might for the time being enforce a different rule from the unwritten law of another state, but this was regarded as only a temporary shortcoming. For each legal question there was only one just solution which would be eventually accepted by all courts if the light of reason could be made sufficiently bright. It was the task of the United States judges, especially a judge possessed of the immense knowledge and brain power of Justice Story, to hold high the torch of the common law and guide less learned state judges out of their present wanderings in the wrong paths. For the sake of this great enterprise, it was worth while to tolerate temporarily a divergence within a single state like New York, between the rule applied to a particular set of facts by New York state judges and the rule applied to the same set of facts by federal judges who possessed a national outlook for legal questions of nationwide importance. Here in the United States was the greatest free trade area in the world. Citizens migrated at ease from one state to another. Commerce flowed across the country without regard to state lines. When these commercial transactions unfortunately came into court, the outcome of the litigation should in turn be independent of state lines. A citizen engaged in nationwide commerce ought to receive the same justice wherever the lawsuit happened to be. "There shall not be one law at Rome, another at Athens."

Despite all the attacks on *Swift* v. *Tyson*, it was very fortunate, I think, that the federal judges could operate independently of state idiosyncrasies during the formative period of our law. The well-developed English principles of equity, for example, spread all over the country through the influence of Story's opinions and books and subsequent decisions by other federal judges. If the *Erie Railroad* doctrine had been adopted a century earlier, the rudimentary equity of many state courts might have remained parochial and unprogressive. Because of *Swift* v. *Tyson*, the Supreme Court and able circuit judges like Baker and Amidon and Learned Hand have influenced the growth of common-law doctrines all over the United States. Story made a great contribution to national unity.

However, as the years went by, things worked out less and less as Story had hoped. In the first place, the Supreme Court decided fewer common-law questions because it was so busy with federal matters. Then, although the federal courts did for some decades swing a good many state courts into line, especially on commercial law, a considerable amount of divergence between various states persisted. As state reports piled up, the common law of each state tended to become crystallized. Thus the ideal of national uniformity was imperfectly realized, and the diversity within a state between state and federal courts became correspondingly more noticeable. As Gray remarked, the situation was as bad as that after the fall of the Roman Empire when there was one law for a suit between Lombards and another law for a suit between Roman citizens. Moreover, the fact that the federal judges stretched the concept of "general law" to cover more and more questions necessarily meant that the diversity between state and federal rules within a particular state came to cover a bigger and bigger area. Astute lawyers were quick to take advantage of this internal confusion of rules of law. There was an immense amount of jockeying so as to get your case into the federal court if the rule there was favorable to your client, or *vice versa*. Hours and days which ought to have been devoted to consideration of the merits

[39] *Eleventh annual report of the American Colonization Society*, 54–55, Washington, 1828.

[40] Digest of Laws for Liberia (1824), article 14th.

of the controversy were spent on this kind of technical manoeuvering.

This evil was aggravated by the application of the diversity jurisdiction of the United States courts to corporations. The Constitution gave those courts jurisdiction over suits between *citizens* of different states. Suppose a suit between a Kentucky individual and a Tennessee corporation. Although the corporation itself was obviously not a citizen, Chief Justice Marshall promulgated the fiction that all its stockholders were citizens of Tennessee when in fact everyone of them might be a citizen of Kentucky. This doctrine made it advantageous for a corporation to get its charter outside the state in which it did its principal business, and then shift litigation against it into a federal court whenever it could gain an advantage by keeping out of the state courts and avoiding an unfavorable state rule of law. Indeed, there were many examples like that furnished by the famous taxicab case, in which a corporation originally chartered in Kentucky where it was doing business gave up its Kentucky charter and reincorporated in Tennessee in order to enter the federal courts whenever it should gain by so doing.

At the same time that these anomalies of opposite legal rules within a state were proving increasingly distasteful to men who thought seriously about law, there arose a growing hope that the ideal of national uniformity could be attained through other agencies than the federal courts operating under *Swift* v. *Tyson*. Story himself made Harvard the first national law school where the desirability of rules of law was canvassed by teacher and students without regard to the particular state in which a student was going to practise. In their classroom discussions the common law of the United States was taken as a reality. The influence of these schools through graduates, law reviews, and the publications of the American Law Institute has tended to bring this ideal into state decisions and—what is still more important—into state legislation. Divergent state statutes on commercial law and other matters affecting citizens of other states were always a fatal obstacle to the attainment of national uniformity by the method of *Swift* v. *Tyson*. So long as such divergent statutes were constitutional, the federal courts were powerless to remedy the resulting legal patchwork. But when lawyers began to think of private law in national terms, they could appeal to the respective state legislatures to reshape pertinent statutes according to generally accepted conceptions of "that which is right." An outstanding example of this trend is furnished by the Uniform Acts which have been drafted by commissioners representing all the states. They have selected subjects where nationwide rules were especially desirable, such as Negotiable Instruments, Sales, Bills of Lading, etc., and much of their work is now enacted in practically every state. It is significant that the very rule of commercial law which Story adopted in *Swift* v. *Tyson*, in opposition to what was then the view of the New York state courts, is today enforced in the New York state courts because of legislative action. The Uniform Negotiable Instruments Law codifies Story's rule for the whole country.

The demise of *Swift* v. *Tyson* in 1938 should, consequently, not be regarded as a conclusive triumph of Austin over Blackstone. More practical causes played a large part. The evils of diversity inside a state were multiplying. The evils of diversity within the nation could now be lessened by other and more satisfactory methods.[41]

Nevertheless, the tale is not yet ended. The *Swift* v. *Tyson* doctrine went too far in producing too many different kinds of law in a single state. The *Erie Railroad* doctrine is going too far in the other direction—too many different kinds of law within a single nation. There are a good many matters which are not likely to be covered by uniform state statutes and yet where nationwide uniformity is highly desirable, such as unfair trade practices and conflict of laws. Since the *Erie Railroad* decision the Supreme Court has delivered these subjects into the hands of state judges, who lack a national outlook. The result has been a notable increase of diversity, which makes the outcome of business disputes depend on the particular federal district in which suit happens to be brought. Therefore, it seems possible that the Supreme Court will eventually recognize that its present rigid adherence to the *Erie Railroad* doctrine is Balkanizing the United States, and that the Court or Congress may move once more toward Story's view that on important questions relating to interstate commerce the federal courts should be free to determine rules of law. Whether they make this law or discover it is irrelevant.

[41] See Shulman, Harry, The demise of Swift v. Tyson, *Yale Law Jour.* **47**: 1336, 1928; Corbin, Arthur L., The common law of the United States, *ibid.* 1351, 1938.

3. IS A COURT DECISION AN "EX POST FACTO LAW"?

The Constitution says that no state shall "pass" any such law. This clause has been interpreted to apply only to retroactive *criminal* laws. It means that after the accused has committed an act, the law must not be changed so as to increase the punishment for it or to render the act punishable if it was not so at the time of its commission. The charge of aggressive warfare at the Nürnberg trial seems to me inconsistent with our constitutional principle.

Undoubtedly, a state criminal statute enacted after the event is invalid if it has the forbidden consequences. How about a subsequent state decision involving the same consequences?

Suppose that an old statute, which punishes "any city official" who accepts a bribe, was judicially construed in 1940 not to apply to public school teachers, on the ground that they are not officials. In 1945 a father offers a high school teacher three hundred dollars to pass his son in algebra. The teacher takes the money, relying on the 1940 decision, and gives the boy a wholly undeserved A. The teacher is prosecuted and convicted under the old statute. The highest state court in 1946 sustains the prison sentence by overruling its 1940 decision and construing the old statute to include bribed public school teachers. The effect is exactly the same as if the legislature had amended the statute in 1946 to apply to previously bribed teachers. Such an amendment would surely have violated the *ex post facto* clause. Is the equivalent retroactive legal rule of the 1946 decision also unconstitutional?

Of course Blackstone would say that the 1946 decision discovers what was always the true meaning of the old statute, so that the teacher's act a year earlier was criminal. His ignorance of the law is no excuse. On the other hand, if judges make law like legislators, the 1940 decision rendered his act lawful and the 1946 decision was a new criminal "law" as much as a statute after the bribe.

The Supreme Court has more than once confined "Law" in the *ex post facto* clause to a state statute, and decided that a retroactive criminal decision prejudicial to the accused does not violate this clause.[42] Justice Van Devanter said in 1913:

> But that provision of the Constitution, according to the natural import of its terms, is a restraint upon legislative power and concerns the making of laws, not their construction by the courts. It has been so regarded from the beginning. . . . [As the purpose of the court's ruling here in question] was, not to prescribe a new law for the future, but only to apply to a completed transaction laws which were in force at the time, it is quite plain that the ruling was a judicial act and not an exercise of legislative authority. . . . "A judicial inquiry investigates, declares and enforces liabilities as they stand on present or past facts and under laws supposed already to exist. That is its purpose and end. Legislation, on the other hand, looks to the future and changes existing conditions by making a new rule to be applied thereafter. . . ."

In this area then, the court supports the unmapped continent theory and it appears to hold that a judicial decision is not a "Law."

Once more the practical result does not inevitably depend on the choice of theory. Looking at the Constitution microscopically, one may say that when the Constitution forbids a state to "*pass* any . . . Law" it singles out statutes from judge-made laws. Even the Austinians would not be likely to speak to a judge as passing a law. Perhaps a decision makes new law, but not the kind of law here forbidden.

A broader justification for this line of cases is found in the great burden of work which a contrary doctrine would throw upon the Supreme Court. State courts in hundreds of criminal cases find it necessary to decide questions of law which were not plainly settled at the time the prosecuted act was committed. If any newly declared rule of law unfavorable to the prisoner were regarded as possibly falling within the *ex post facto* clause, then the lawyers for convicted persons would resort to the Supreme Court far more often than they already do. The Supreme Court is too busy with treaties and Acts of Congress and nationwide strikes to want to be the highest court of appeal for state criminal cases.

4. IS A JUDICIAL DECISION A "LAW IMPAIRING THE OBLIGATION OF CONTRACTS"?

This clause of the Constitution raises much the same considerations as the *ex post facto* clause which immediately precedes it. The Constitution is undoubtedly violated by a state statute establishing a new defense against a previously made contract. Is it also violated by a state decision granting a defense contrary to judicial authority at the time the contract was made? For example, municipal bonds were valid according to the de-

[42] *Ross* v. *Oregon*, 227 United States Reports 150 (1913); *Frank* v. *Mangum*, 237 United States 309 at 344 (1915).

cisions of the state court before they were issued. Later the city stops paying interest and the bondholders sue. Now the state court overrules all the old decisions and declares that the city had no power to borrow the money. The bondholders' contract is clearly impaired after they had invested in the bonds, but is it impaired by a "Law" as it would be by a subsequent statute making the bonds worthless? Blackstone would say not, because the defense was always there in the law even though the Court did not discover it correctly until after the parties bargained. The Austinians would regard the old decisions as the law governing these bonds, and the present decision as a new law.

Here again the Supreme Court has steadily refused to reverse the state court. There must be a state statute involved in order to impair the obligation of the contract unconstitutionally.[43]

This result too can be explained on the ground that the words "*pass* any . . . Law impairing the Obligation of Contracts" are not appropriate to a judicial decision. I prefer to rest the refusal of the Justices to consider decisions prejudicial to existing contracts on the Court's desire to concentrate attention on bigger matters. The Justices do not want to be burdened with a tremendous mass of cases from state courts which declined for all sorts of reasons to enforce the contract. It was wise to limit this constitutional clause to statutes enacted after the formation of the contract.

"If we did [otherwise]," said Justice Shiras,[44] "every case decided in the state courts could be brought here, when the party setting up a contract alleged that the court took a different view of its obligation from that which he held."

5. WHEN A STATE DECISION ENUNCIATES AN ARBITRARY AND UNREASONABLE RULE OF SUBSTANTIVE LAW, DOES THE STATE "DEPRIVE ANY PERSON OF LIFE, LIBERTY, OR PROPERTY WITHOUT DUE PROCESS OF LAW" IN VIOLATION OF THE FOURTEENTH AMENDMENT?

We are not now concerned with unfair court procedure such as a denial of notice or a hearing. Everybody agrees that it is wrong to refuse a person his day in court, whether the refusal is directed by a statute or not.[45] We are concerned only with arbitrary rules as to the rights and duties of the parties. If state courts make law, as the skyscraper theory holds, then the Fourteenth Amendment is logically violated by a decision which applies a rule of substantive law which could not constitutionally be put into statutory form. Under the unmapped continent theory, however, it is not the state which makes the objectionable rule of law through its judges. The rule is outside them and they are merely mapping it. Perhaps they have made a mistake in their mapping, but the Constitution does not require the Supreme Court to correct all the mistaken decisions of state courts.

The Supreme Court has steadily insisted that there must be state legislative action to bring the Fourteenth Amendment to bear on state rules of substantive law. For decades the Court has refused to review purely judicial action on this basis. Justice Gray declared a half-century ago:[46]

When the parties have been fully heard in the regular course of judicial proceedings, an erroneous decision of a state court does not deprive the unsuccessful party of his property without due process of law, within the Fourteenth Amendment. . . .

And Chief Justice Stone remarked ten years ago:[47]

In any case the Constitution of the United States does not guarantee that the decisions of state courts shall be free from error. . . .

There have been two or three exceptions since 1940,[48] for example, when a state labor injunction had such wide terms as to impair freedom of speech seriously in the Court's opinion; but these few cases have been treated as very special in their nature and have not weakened the main doctrine.

The doctrine just described furnishes additional support for the unmapped continent theory. Yet I think that its real ground is the policy already explained in connection with *ex post facto* laws and

[43] *Railroad Co.* v. *McClure,* 10 Wallace Reports 511 (1871) and many other cases. The authorities were reviewed by Chief Justice Taft in *Tidal Oil Co.* v. *Flanagan,* 263 United States Reports 444 (1924). If the bondholders sue in a federal court, it may follow the state decisions before issue in order to protect reliance upon them, but the contracts clause is not involved. *Gelpcke* v. *Dubuque,* 1 Wallace Reports 175 (1864).

[44] *Morley* v. *Lake Shore Railway Co.,* 146 United States Reports 162 at 171 (1892).

[45] See, for example, *Brinkerhoff-Faris Trust & Sav. Co.* v. *Hill,* 281 United States Reports 673 (1930).

[46] *Central Land Co.* v. *Laidley,* 159 United States Reports 103 at 112 (1895).

[47] *Worcester County Trust Co.* v. *Riley,* 302 United States Reports 292 at 299 (1937).

[48] *Cantwell* v. *Connecticut,* 310 United States Reports 296 (1940); *American Federation of Labor* v. *Swing,* 312 *ibid.* 321 (1941). See *Milk Wagon Drivers Union* v. *Meadowmoor Dairies,* 312 *ibid.* 298 (1941).

impairing the obligation of contracts. If all unjust judicial decisions were brought within the Fourteenth Amendment, the burden of work on the Court would be even greater than if decisions fell within the two clauses in the original Constitution because the element of retroactivity, there essential, is not necessary to bring the due process clause into play. It is very much simpler for the Justices to say that they are not going to bother with that type of case at all.

So even if the Supreme Court were willing to push the skyscraper reasoning of Holmes and the *Erie Railroad* case to its logical limits and concede that state judges always make law for the parties to a case, I think that the Justices would still say that court decisions on substantive law were not the kind of state-action against life, liberty, or property which they have to investigate in their court room. At any rate, the Court has insisted that the Constitution does not force the states to take either side of the controversy between the skyscraper theory and the unmapped continent theory. Justice Cardozo said:[49]

> We think the federal constitution has no voice upon the subject. A state in defining the limits of adherence to precedent may make a choice for itself between the principle of forward operation and that of relation backward. It may say that decisions of its highest court, though later overruled, are law none the less for intermediate transactions. . . . On the other hand, it may hold to the ancient dogma that the law declared by its courts had a Platonic or ideal existence before the act of declaration, in which event the discredited declaration will be viewed as if it had never been, and the reconsidered declaration as law from the beginning. . . . The choice for any state may be determined by the juristic philosophy of the judges of her courts, their conceptions of law, its origin and nature. We review not the wisdom of their philosophies, but the legality of their acts. . . . we are not at liberty, for anything contained in the constitution of the United States, to thrust upon those courts a different conception either of the binding force of precedent or of the meaning of the judicial process.

CONCLUSION

The five situations just described do not give uniform support to either theory of what judges do. State courts in the first situation on the effect of overruling decisions tend to favor the skyscraper theory while the Supreme Court is shrewdly noncommittal. In the second situation, the Supreme Court formerly inclined toward the unmapped continent theory of *Swift* v. *Tyson*, but during the last ten years the *Erie Railroad* case swung it violently toward the skyscraper theory. In the last three situations—*ex post facto* laws, impairment of the obligation of contracts, and the due process clause—the Court somewhat supports the unmapped continent theory. Therefore, we cannot say that either theory is accepted as prevailing. Furthermore, I have shown that in each situation there are strong reasons of policy sufficient to justify the results reached regardless of any choice between the two theories.

Finally, it seems to me unlikely that courts will ever thoroughly adopt either theory. Indeed, it would be regrettable if they should do so, because each theory contains a core of valuable truth which cannot be rejected.

The skyscraper theory recognizes the personal element in decisions, which Blackstone ignores. Judges like to talk as if their decisions were wholly uninfluenced by independent factors. Yet when they discuss the decisions of a great judge whom they admire, like Mansfield or Marshall or Holmes or Cardozo, they recognize an element of creativeness in that man's work. The legal rules which a great judge declares would be different if they were declared by a lesser man or indeed by some other great judge. We cannot get outside ourselves to do our thinking and each of us inevitably puts something of himself into the general principles by which he shapes his conclusions about a set of facts, even undisputed facts. Logic does not lead inevitably to a single sound rule of law for every conceivable legal problem. In close questions, which are the sort most likely to come before appellate courts, there is a choice between competing analogies. Often a choice either way is warranted. Englishmen drive to the left and Americans drive to the right. Nobody believes that in the unmapped continent of law there is only one proper side of the road. A good many legal problems are of this sort, although not of course all. Furthermore, the thoughtful revelations of able judges about their own work, such as we find in Cardozo's *Nature of the Judicial Process*, reveal this sense of creativeness, of deliberate choice after long pondering. These men know that what they say is not entirely outside themselves. The difference between a good judge and a bad judge is more than a difference between a brilliant man and a stupid man. In the decision of novel questions the right principles of law do not shine through the best judge the way the landscape is

[49] *Great Northern Railway* v. *Sunburst Oil Co.*, 287 United States Reports 358 at 364–366 (1932).

seen through a plate glass window. The man himself is a part of what he decides.

On the other hand, law is very much more than the fiat of any single judge or group of judges. Even Austin qualified Bentham's view that the judges make whatever law they please by pointing out that the bar plays a large part in the process, both through the arguments of the lawyers in the case and through the sensitiveness of the bench to the subsequent criticisms of the bar. Austin says that the law is made by "Judges & Co." I should go much farther than that. Law is more than the product of individual wills of judges and lawyers. If it were only that, citizens would have little reason for submitting to the rules of the common law except the fear of punishment for disobedience. For the most part men obey the law without litigation or accept quickly the outcome of litigation, because they feel that law is the embodiment of certain generally recognized norms outside any single individual. It is their rational recognition of the objective truths and values in law which mainly imposes the obligation to obey the law.[50] Newly declared legal rules are not made by judges out of whole cloth. They are drawn by search and by analogy from the body of already existing rules and the complex relations of mankind. If I seem to return to "the brooding omnipresence in the sky," which Holmes ridiculed, it is easy to retort that this brooding omnipresence is no more mythical than Holmes's sovereign whom nobody has yet seen.[51] There is no sense in trying to substitute for the will of the judges the will of the whole people of the state, most of whom neither know nor care about the issues involved in the litigation. In so far as the judge is not applying his own will, he is likely to be resorting to a body of principles which may have no physical location, but neither has courage nor loyalty nor love of truth.

Therefore it is legitimate to reconcile the two sides of this centuries-old controversy by saying that the judges make law out of what they discover, and that law is the will of the Justices trying to do that which is right.

[50] Review of Hallowell, *Decadence of Liberalism*, in *Times Literary Supplement* (January 25, 1947).

[51] See Fuller, Lon L., *The law in quest of itself, passim*, Chicago, Foundation Press, 1940.

THE DIFFUSION AND INFLUENCE OF LOCKE'S *ESSAY CONCERNING HUMAN UNDERSTANDING* IN FRANCE BEFORE VOLTAIRE'S *LETTRES PHILOSOPHIQUES*

GABRIEL BONNO

Professor of French, University of California

(*Read April 25, 1947*)

ONE of the most important influences exerted on French thought in the eighteenth century is that of Locke's *Essay Concerning Human Understanding*. When Voltaire extolled the merits of the English philosopher in his *Lettres Philosophiques*, he made a significant contribution to the development and to the orientation of that influence, but, contrary to his claim, he did not initiate it. Voltaire's book was published in 1734, while the first English edition of the *Essay* had appeared in 1690. In the intervening decades Locke's philosophy had not been completely unknown in France: there was a pre-Voltairian phase in the diffusion and influence of the *Essay*. However, that early period does not seem to have received adequate attention, and we intend to examine it in this paper.

It is rather interesting to note that the first public presentation of the *Essay* (at least in its substance) took place on the continent and was in French. In January 1688 one of Locke's friends, Jean Leclerc, editor of the *Bibliothèque Universelle*, published in this famous Amsterdam periodical a long article of about one hundred pages entitled "Extrait d'un livre Anglois qui n'a pas encore paru, intitulé Essai philosophique concernant l'entendement." It was an epitome of the *Essay* which had been written in English by Locke himself and translated into French by Leclerc. At a time when few people on the continent could read English, while French had supplanted Latin as the international cultural language of Western Europe, Locke thus sought a way to test the reaction of continental readers to his views, before sending to the press the manuscript of his *Essay*. In fact it was through this French abridgment that his philosophy first became known to Bayle and to Leibniz.[1]

Throughout the following decade continental readers unfamiliar with English received their information about the *Essay* from the French periodicals published in Holland, which were widely read in France. In 1690 the first edition was reviewed at length by Leclerc; in 1694 a detailed account of the additions and alterations made in the second edition was given by Basnage de Beauval in the *Histoire des Ouvrages des Savans*.[2] The journalists also discussed the objections raised against the *Essay* by John Norris in his *Cursory Reflections upon a Book call'd an Essay concerning Human Understanding* and by Lowde in his *Discourse concerning the Nature of Man*;[3] they devoted several articles[4] to the long controversy between Locke and Stillingfleet, Bishop of Worcester, about the mysteries of faith, the notion of substance and the implications of the incidental remark that was to be so strongly stressed in Voltaire's *Lettres Philosophiques:* "Possibly we shall never be able to know whether any mere material being thinks or no."[5]

After that preliminary phase the diffusion of the *Essay* was considerably quickened in 1700 by a French translation, carefully prepared by Pierre Coste, Locke's amanuensis, under the personal supervision of the author. For half a century this French version remained the most important vehicle for the European diffusion of the *Essay*. At a time when the English language was still very little known on the Continent, Coste's translation was used in Holland by Barbeyrac, in Italy by Muratori and Doria, in Switzerland by Bodmer and Breitinger, in Germany by Leibniz and even much later by Schiller.[6] In France Coste's translation

[1] Bayle, Pierre, *Œuvres diverses* IV: 737, The Hague, Husson, 1731; Leibniz, Gottfried, Letter to Thomas Burnet, in C. J. Gerhardt, *Die philosophischen Schriften von G. W. Leibniz* III: 181, Berlin, Weidmannsche Buchhandlung, 1887.

[2] *Bibliothèque Universelle* **17**: 399–427, May 1690; *Histoire des Ouvrages des Savans* **12**: 441 ff., June 1695.

[3] *Bibliothèque Universelle* **20**: 65–72, Jan. 1691 (Norris); *Histoire des Ouvrages des Savans* **11**: 416 ff., May 1694 (Lowde).

[4] *Histoire des Ouvrages des Savans* **14**: 420, May 1697; **14**: 551, Aug. 1697; **15**: 134, March 1698; **22**: 135, March 1705; *Nouvelles de la République des Lettres* **2**: 105–150, Oct., Nov. 1699.

[5] Locke, John, *Essay concerning Human Understanding*, 441, London, Routledge, 1917.

[6] Barbeyrac, Jean, Preface to the French translation of Pufendorf's *De jure naturae et gentium*, Amsterdam, Schelte, 1706; Muratori, Lodovico, Preface to *La Filosofia morale*, 2nd ed., Verona, Targa, 1737; Doria, Paolo, Pref-

was circulated by Locke himself among his French friends like Nicolas Thoynard and Abbé Du Bos, to whom he sent copies of the book, fresh from the press, with a pressing appeal for their comments.[7]

In the following years Coste's translation, re-edited in 1723 and in 1729, was supplemented by various publications drawing the attention of French readers to the *Essay:* in 1710 Leclerc published a French translation of Locke's *Posthumous Works,* containing the important piece on "The Conduct of the Understanding," originally intended to form an additional chapter in the fourth edition of the *Essay;* in 1720 the critical annotations of Leibniz on the first two books of Locke's treatise were published by Desmaizeaux in his *Recueil de diverses pièces sur la philosophie,* and in the same year Bosset translated into French the Abridgment of the *Essay* made by John Wynne in 1696 for the benefit of Oxford students; in 1729 a long article on Locke appeared in the first volume of Nicéron's *Mémoires pour servir à l'histoire des hommes illustres dans la République des Lettres.*[8]

During that early period of diffusion French discussions of the *Essay* center around two main points: Locke's rejection of innate ideas and his remark about thinking matter. Inneism is defended against the attacks of the English philosopher by several disciples of Malebranche like Père André,[9] and by Cardinal de Polignac in his Latin poem *Anti-Lucretius,* where he develops the theme introduced by these two significant lines:

> Quanquam ergo fateor cognosci plurima sensu
> Plurima sunt etiam quae pura mente videntur.[10]

D'Aguesseau in his *Méditations métaphysiques* maintains that Locke's criticism is based on a misconception of innate ideas, which should not be defined as distinct notions or maxims explicitly present in the mind, but simply as innate dispositions of a universal character. If this correct interpretation is adopted, says d'Aguesseau, Locke's objections can be easily refuted, and he undertakes to present such a refutation in regard to the ideas of God and of justice.[11] While the *Essay* thus encounters the opposition of several Cartesians and Malebranchistes, its empirical conception of knowledge receives the approval of various French authors, such as Chansierges in *Le Système de l'Esprit* (1723), Fréret in his *Lettre de Thrasibule à Leucippe* (published in 1768, but written in 1722), Levesque de Burigny in his *Histoire de la Philosophie Payenne* (1724) and Boulainvilliers, who died in 1722, in his undated manuscript entitled *Considérations abrégées des opérations de l'entendement humain sur les idées.*[12] The most significant case is that of Bayle, originally an ardent Cartesian, who in his *Systema totius philosophiae* (1675–1678) had vigorously defended inneism against the attacks of Gassendi. However, after reading the French translation of Locke's *Essay* in 1703, Bayle wrote to Coste:

> J'ai lu ce que M. Locke a écrit contre les idées innées dans son Essai de l'entendement, et je vous assure qu'il m'a semblé victorieux, et qu'il faut donner à son combat la gloire du *debellatum est.*[13]

The question of thinking matter had been brought to the attention of French readers, first by periodical articles on the controversy between Locke and Stillingfleet, and later by a long note on the same subject that Coste had inserted in the second edition of his translation in 1729. It is interesting to note that in the early French reactions to that controversial issue there is complete agreement between Bayle and the Jesuit editors of the *Journal de Trévoux.* In both cases the implications of Locke's remarks are sharply criticized. To the journalists of Trévoux it represents a dangerous orientation towards material-

ace to *Difesa della Metafisica,* Venice, 1732; Reynold, Gonzague de, *Bodmer et l'Ecole Suisse,* 134, Lausanne, Bridel, 1912; Leibniz, Gottfried, Letter to Coste in Gerhardt, *op. cit.* III: 392; Schanzenbach, Otto, *Französische Einflüsse bei Schiller,* 46, Stuttgart, Liebich, 1885.

[7] Locke, John, Letter to Nicolas Thoynard, May 21, 1700, in H. Ollion, *Lettres inédites de John Locke,* 140, The Hague, Nijhoff, 1912.

[8] Locke, John, *Œuvres diverses traduites par Jean Leclerc,* Rotterdam, Fritsch and Bohm, 1710; Desmaizeaux, Pierre, *Recueil de diverses pièces sur la philosophie,* Amsterdam, Du Sauzet, 1720; Bosset, Jean-Pierre, *Abrégé de l'Essai sur l'entendement humain,* Geneva, Bousquet, 1720; Nicéron, Jean-Pierre, *Mémoires* I: 35–49, Paris, Briasson, 1729.

[9] Nicéron, Jean-Pierre, *Mémoires* X: 7, Paris, Briasson, 1729.

[10] Polignac, Melchior de, *Anti-Lucretius* II: 210, Paris, Desaint, 1747.

[11] D'Aguesseau, Henri-François, *Œuvres complètes* IV: 245 ff., Paris, Libraires associés, 1777.

[12] Chansierges, Pierre, *Le Système de l'Esprit,* 109, Paris, Saugrain, 1723; Fréret, Nicolas, *Lettre de Thrasibule à Leucippe,* 130 ff., London, n.d.; Levesque de Burigny, Jean, *Histoire de la Philosophie payenne* I: 51, The Hague, Gosse, 1724; Boulainvilliers, Henri de, *Extraits des lectures de M. le Comte de Boulainvilliers,* 42–147, Paris, Bibliothèque Nationale, French manuscript 11, 703.

[13] Bayle, Pierre, *Œuvres diverses,* IV: 834, The Hague, Husson, 1731.

ism;[14] as for Bayle, he writes to Shaftesbury in 1699 that on this question he agrees with Stillingfleet;[15] later on, he devotes the fifteenth chapter of his *Réponse aux Questions d'un Provincial* (1705) to a discussion entitled "Difficultés qui accompagnent un sentiment de M. Locke." There the remark about thinking matter is denounced as leading back to "l'ancien chaos des Scolastiques" and as implying a conception of substance as indefensible as that of Spinoza. A similar attitude appears in Bayle's *Dictionnaire* (Article *Dicéarque*, note *M*) where the notion of thinking matter is ironically dismissed as a mere restatement of the "puissance obédentielle" of matter, according to which, by the will of God, "une pierre deviendrait capable de la vision béatifique."

While these various discussions show the degree of attention and interest already commanded in France by the *Essay* in the early part of the eighteenth century, its influence on French thought is particularly exemplified in the case of two writers: Du Bos and Buffier.

Du Bos was a personal friend of Locke; having made his acquaintance in London in 1698, he had kept up a correspondence with him in the following years and he had received from Locke himself a copy of Coste's translation of the *Essay*. There is no doubt that he carefully read it because its influence appears in the *Réflexions critiques sur la poésie et la peinture*, published in 1719. In this book, for which he has been called the founder of modern aesthetics in fact if not in name, Du Bos applies to the criticism of literature and art the empirical and sensualistic interpretation of human knowledge presented by Locke in the *Essay*. His argumentation against the universal validity of literary rules closely parallels that of the English philosopher against innate ideas; both writers appeal to the variety of human experience and draw many of their examples from accounts of travels in the Orient. Maintaining that all aesthetic impressions derive from what he calls "un sixième sens," Du Bos describes the operation of that sixth sense in terms strongly reminiscent of the language of Locke in the *Essay*: "Son opération prévient tous les raisonnements ainsi que l'opération de l'œil et celle de l'oreille les devancent dans leurs sensations."[16] Du Bos stresses the empirical origin of the idea of beauty, and he defines literary rules as "un assemblage méthodique de principes arrêtés d'un consentement général, en conséquence des observations faites sur les effets de la nature."[17] He also proclaims the relativity of taste and points out the importance of the historical and social background for a valid appreciation of literary and artistic works. If we recall that in these early decades of the eighteenth century French literary criticism was completely dominated by rationalistic tendencies and that Du Bos himself in his youth had been an ardent Cartesian, we shall recognize in his *Réflexions critiques* an adaptation to the field of aesthetics of the empirical teachings of Locke's *Essay*.

Claude Buffier was a Jesuit professor at the Collège Louis-le-Grand in Paris and one of the editors of the *Journal de Trévoux*. His interest in Locke is clearly shown by one of his manuscripts (now at the Bibliothèque Nationale[18]) which contains a detailed outline of the *Essay*, made from Coste's translation and interspersed with numerous personal comments. Buffier's admiration for the English philosopher is expressed in very explicit terms:

> M. Locke est le premier de ce tems-ci qui ait entrepris de démêler les opérations de l'esprit humain immédiatement d'après la nature, sans se laisser conduire à des opinions appuyées plutôt sur des systèmes que sur des réalités; en quoi sa philosophie semble être par rapport à celle de Descartes et de Malebranche ce qu'est l'histoire par rapport aux romans.[19]

No less evident is the influence exerted by the *Essay* on Buffier's most important philosophical work, his *Traité des premières vérités*, published in 1724. The French Jesuit completely agrees with Locke's criticism of Descartes and Malebranche; he adopts the empirical method of the English philosopher and closely follows him in his interpretation of simple ideas, as well as in his analysis of complex ideas; the influence of the *Essay* is particularly obvious in Buffier's discussion of substance and essence, of infinity, of probability, of definition and also in the type of argumentation chosen to prove the existence of God.[20]

[14] *Journal de Trévoux* 1: 128, Jan. 1701.

[15] Bayle, Pierre, *op. cit.* IV: 786.

[16] Du Bos, Jean-Baptiste, *Réflexions critiques sur la poésie et sur la peinture* II: 341, Paris, Pissot, 1770.

[17] *Ibid.* II: 333.

[18] Buffier, Claude, *Précis de l'Essai de Locke*, Paris, Bibliothèque Nationale, French manuscript 14,700.

[19] Buffier, Claude, *Remarques sur la Métaphysique de M. Locke*, in appendix to *Traité des premières vérités*, 253, Paris, Maugé, 1724.

[20] Buffier, Claude, *Traité des premières vérités*, 87, 115, 130, 145 ff., Paris, Maugé, 1724.

However, in spite of these numerous borrowings, Buffier's *Traité* is not a mere echo of the *Essay*. The French author does not always accept Locke's interpretation of complex ideas; he sharply criticizes the English philosopher in regard to the explanation of the ideas of duration, identity, and liberty. Besides, the empirical and analytical method of Locke is combined by Buffier with his basic doctrine of "common sense." According to his own definition, "le sens commun est une disposition que la nature a mise dans tous les hommes, ou manifestement dans la plupart d'entre eux pour leur faire porter, quand ils ont l'usage de la raison, un jugement commun et uniforme sur les objets différents du sentiment intime de leur propre perception, jugement qui n'est point la conséquence d'aucun principe antérieur."[21] While in England the vagueness of Locke's statements about the representative nature of ideas led to such developments as Berkeley's idealism and Hume's skepticism, Buffier's treatise precluded similar interpretations. It is significant to note that the French Jesuit was acknowledged as a precursor by Thomas Reid, when the latter attempted to react against the idealistic conception of knowledge and to reinstate Locke's empirical approach in a realistic context.

In his unpublished analysis of the *Essay*, Buffier gives special attention to the chapters of the fourth book discussing the relations between reason and faith. In his personal comments he accepts Locke's principle that "one cannot admit as revealed truth a proposition that would be evidently contrary to reason," but he mitigates this rationalistic tendency in two ways. First, by affirming the suprarational character of revealed truths, he limits the role of reason to determining whether or not a given proposition has been actually revealed; furthermore, Buffier refuses to accept Locke's remark that the value of testimony is weakened by the passing of time and can lead only to probability; he maintains that after any length of time the unanimous agreement of trustworthy witnesses can lead to certainty.[22] So while both philosophers hold a concordist position in regard to the relations between reason and faith, Buffier imposes narrower limits on the role of reason and stresses more strongly than Locke that the assent of faith is based on a knowledge higher than probability, although its certainty is not demonstrative.

From this survey of the early diffusion and influence of Locke's *Essay* in France, several conclusions can be drawn. The first one is the international importance of the French translation of the *Essay* by Coste for the diffusion of Locke's philosophy in Western Europe. A second remark can be made in regard to the real aim of Locke's polemic against innate ideas. Until the end of the nineteenth century the traditional interpretation was that Locke's attacks were directed against Descartes and the Cartesians, but in more recent years several other theories have been advanced. Some claim that Locke was thinking of the Cambridge Platonists, others that he was referring to the University teachers of his day, others still that he was setting up a man of straw in order to present his own views more vividly.[23] However that may be, the fact is that, when the *Essay* first became known in France, its attacks upon inneism were interpreted by all its readers as directed against Descartes and the Cartesians, which was also the significance attached to the polemic by Leclerc in Holland and by Leibniz in Germany. Finally we can see the exact meaning of the remark made by Voltaire when he wrote to Horace Walpole in 1768 that before the *Lettres philosophiques*, "à peine avait-on entendu parler de Locke en France."[24] It seems highly improbable that Voltaire was ignorant of the early diffusion of the *Essay* among his countrymen. When he praises Locke in his *Lettres philosophiques*, he uses the comparison between history and romance which had already been made by Buffier. The French Jesuit had said: "Sa philosophie semble être, par rapport à celle de Descartes et de Malebranche, ce qu'est l'histoire par rapport aux romans." Voltaire writes: "Tant de raisonneurs ayant fait le roman de l'âme, un sage est venu qui en fait modestement l'histoire."[25] Truly an amazing coincidence, if purely accidental! But what Voltaire really had in mind when he wrote his letter to Walpole was the conservative attitude of his French predecessors in their interpretation of Locke's philosophy. His remark about thinking matter had been criticized by Bayle as well as by the Jesuit editors of the *Journal de Trévoux;*

[21] *Ibid.*, 23.

[22] Buffier, Claude, *Précis de l'Essai de Locke*, 95–108, Paris, Bibliothèque Nationale, French manuscript 14,700.

[23] Aaron, Richard Ithamar, *John Locke*, 76–77, London, Humphrey Milford, 1937.

[24] Voltaire, François-Marie Arouet de, Letter to Horace Walpole, July 15, 1768 in *Œuvres complètes* (Moland edit.) XLVI: 79, Paris, Garnier, 1882.

[25] Voltaire, *Lettres philosophiques* I: 168, Paris, Droz, 1937.

his rationalistic tendencies in religious matters had been mitigated by the interpretation of Buffier. Quite different is the presentation of the *Essay* offered by Voltaire in his *Lettres philosophiques*. The incidental remark of Locke about thinking matter is detached from its context, stressed and adroitly exploited against the doctrine of the theologians regarding the immateriality and immortality of the soul. As for the statements of Locke concerning the relations between reason and faith, they are transposed into ironical allusions to "nos mystères . . . contraires à nos démonstrations" and to the opposition of faith and reason, an attitude completely reversing the concordist position of the *Essay*. Voltaire then was not unjustified in thinking that before his own *Lettres philosophiques* such an interpretation of Locke's philosophy had hardly been heard of in France. One might add that such a message can hardly be said to be present in the *Essay*.[26]

[26] An extensive treatment of this subject will appear in the *Transactions* of the American Philosophical Society, volume 38. The author was aided in his study by a grant from the Society.

THE WEST COAST CORRIDOR

HERBERT E. BOLTON

Sather Professor Emeritus of History, University of California

(*Read April 24, 1947*)

THIS paper is designed to outline a problem for research rather than to solve it. I have gathered from the archives of Mexico, Spain, and other countries many thousands of pages of unpublished manuscript records bearing on the development of the West Coast of Mexico, a region with a most interesting and significant history, but which has been written only in slender outline or in particular spots. My aim today is to place the area in historical perspective, though I fully realize that in a twenty-minute sketch it will be difficult to find a middle ground between bald generalizations and details which obscure the pattern.[1]

Ever since the Spanish conquest in the sixteenth century a vast area in northern Mexico open for development has been a spur to the initiative of people in the more crowded regions farther south. Turner wrote a brilliant monograph on the significance of the frontier in the development of society in English North America. It would be interesting to consider to what extent his thesis is applicable or inapplicable to the history of New Spain—but that is not my theme today.

The place in Mexico where European and native have had longest and most vital contact is in the southern and central areas, where the indigenous peoples had a high civilization before the Spaniards arrived. Here during the conquest and in succeeding decades, European and native first fused their cultures and their blood. Here Spanish law and government were superimposed upon native institutions, but never wholly eradicated them. The two elements were complementary, each modifying the other. In this respect Spain was amazingly tolerant, as can be seen on many pages of the great *Recopilación de las Leyes de las Indias*, or code of public law for the New World.

Meanwhile another chapter in Mexican history was begun. The area of Spanish settlement was extended northward into regions inhabited by natives representing a relatively primitive society—peoples whom the Spaniards designated by the word *Chichimecos*—a term which became descriptive of non-sedentary tribes or bands, as distinguished from the highly civilized natives of southern and central Mexico. Here the historical process was fundamentally different from what it was in the area of advanced peoples. The Chichimecos were rapidly killed off in war or by new diseases, and the terrain left open for a more purely Spanish stock. Beginning on the eastern coast north of Vera Cruz, the line separating the two types of natives indicated, ran generally westward, passing a short distance above Mexico City and Guadalajara to Compostela and Tepic. The area of the nonsedentary or unstable peoples was the scene of a great panorama of frontier expansion analogous to the Westward Movement in English North America dealt with by Turner and his disciples.

The colonization of northern Mexico above this line was directed to a large extent by two great mountain chains—the Sierra Madre Oriental, and the Sierra Madre Occidental—stupendous and difficult barriers which divide the area into three distinct geographical provinces: (1) the East Coast Corridor, a wide plain lying between the eastern sierra and the Gulf of Mexico; (2) the West Coast Corridor, a narrow plain between the Sierra Madre Occidental and the Pacific Ocean; and (3) the great Central Plateau, or Mesa Central, between the eastern and western sierras. The development of the East Coast Corridor was greatly influenced by the Gulf of Mexico, and that of the West Coast Corridor by the Gulf of California and the Pacific Ocean.

In pursuit of various objectives, the Spaniards made their way north in three principal columns determined by these corridors. The East Coast salient of mining and stock raising carried Spanish civilization north from the Pánuco border the length of Tamaulipas into Nuevo León and across the lower Rio Grande, where Laredo and a score of present-day towns and cities farther south are monuments to the spectacular achievements of the

[1] A generous research grant from the American Philosophical Society has enabled me to have the very competent assistance of Miss Virginia E. Thickens in listing and photostating in the archives of Mexico several thousand pages of rare original manuscripts bearing on the historical development of the West Coast Corridor, which will be utilized in the preparation of a monograph on the subject.

great colonizer Escandón in the eighteenth century. The long cattle drive which began in Tamaulipas crossed the Rio Grande and eventually reached Montana, to which the lineage can be historically traced.

The Central Plateau of Mexico was the scene of vast mining developments in Zacatecas, San Luís Potosí, Durango, Chihuahua, Coahuila, and Nuevo León, storehouses of precious metals which, together with the mines of Perú, did so much to revolutionize economic life that some day, when we really become world-minded, they will form a chapter in every general book on the making of the modern era. The Chihuahua-Coahuila frontier carried European civilization north into Texas, Louisiana, and New Mexico. Here Spanish cavalry wrestled with Apaches and Comanches long before the Yankees arrived on the scene—witness the name Greenhorn Mountains on the map of Colorado, applied in honor of a victory by Governor Anza of New Mexico over Cuerno Verde, or Green Horn, chief of Comanches, in 1776. American history has not by any means been a wholly Westward Movement.

The West Coast Corridor, the main theme of this paper, runs with minor breaks continuously north from Tepic in Mexico to Alaska. It came into history as North America's outpost toward the Orient—a character which it still maintains. From the Isthmus of Panamá was resumed the task which Columbus thought he had accomplished —the finding of a route to the East Indies. The discovery of the South Sea was followed by feverish northward exploration of the Pacific shores, with a view to reaching Cathay. Within three years after Balboa's vision from "the peaks of Darién" the entire western shore of Central America had been run from Panamá to the borders of Mexico. Now far-seeing Cortés took up the quest. Crossing the continent, he forthwith opened shipyards on the Pacific coast as a base for communication with the Orient. Five years later Saavedra, in ships built by the conqueror at Zacatula, sailed west and reached the Moluccas. But he could not get back because of contrary winds. He had discovered a stubborn handicap to commerce with the Far East.

Conflict between Spain and Portugal over the Spice Islands brought West Coast America into prominence in world affairs. Portugal had the advantage of position, so Charles V sold Spain's rights to the Moluccas, but maintained her title to the Philippines. Then, in 1542, at the same time that Cabrillo and Ferrelo ran the entire shore line of California to Oregon, Villalobos, sailing west from Mexico with a related objective, took possession of the Philippines, but was captured by the Portuguese.

King Philip now decided to make Spain's claim stick. Legazpi in 1564 sailed in two ships from Acapulco and took effective possession of the disputed islands. Urdaneta, his pilot, was first to overcome the handicap of headwinds and find a way back across the Pacific. Sailing north from the islands he entered the belt of westerly winds, reached the American shore near Oregon, and descended the west coast to Acapulco. Legazpi founded Manila in 1571. Thereafter for some two hundred and fifty years Spain's Manila galleons, conducting her trade with the Orient, followed Urdaneta's route across the Pacific and down the west coast. On the long voyage, with bad food, sailors and passengers suffered terribly from scurvy, but the galleons sometimes stopped on the Sinaloa coast to find relief from citrous fruits. The story that this cure was first discovered by Cook in 1776 is another English myth. In fact, two centuries earlier, Menéndez de Aviles, on his way from Spain to found St. Augustine in Florida, stopped at the Canary Islands for a supply of limes to prevent the ravages of scurvy.

Throughout the seventeenth and eighteenth centuries Spain's West Coast activities were largely defensive, designed to meet the threats and inroads of English, Dutch, French, and Russians in the Pacific. Operating in the North Atlantic the French and English sought the Strait of Anian as a route to Cathay. Spain's fears became realities when, in 1577, Drake passed the Straits of Magellan, raided the coasts of South America, landed on the California shore near San Francisco Bay, took possession of what he called New Albion, in the name of Queen Elizabeth, and left his calling card in the shape of a Plate of Brasse and a silver sixpence bearing the picture of her Majesty. Cavendish plundered the Manila galleon, *Santa Ana*, on the California Peninsula (1586), burning it to the water's edge. In the wake of the English and French came the Dutch (the "Pichilingues"), who threaded the Straits of Magellan before the end of the sixteenth century and soon reached the Gulf of California, where a harbor is still called the Pichilingue Bay.

To protect Spain's interests, Vizcaino now established a Spanish colony at La Paz (1596), reexplored the entire California coast (1602), and

discovered Monterey Bay, another landmark in the sequence of events.

The colonization of the California Peninsula, or Lower California, was encouraged by promoting the pearl fisheries, under contracts with speculators, some of whom were experienced pearl-hunters from the Caribbean. Thus Cardona was granted the monopoly of this enterprise in California in 1614. Acting for him, Iturbi a year later made a voyage to the head of the Gulf, and on his return one of his vessels was captured by the Dutch freebooter, Spillberg, who illustrates the international character which California had now acquired. Later contracts were made with Ortega (1633), Porter y Casante (1648), Piñadero (1664, 1667), Lucenilla (1668), and Atondo (1679). Some of them prospered, others went broke.

Finally, in 1697, the California Peninsula was turned over to the Jesuits with the protection of a small Spanish garrison. The Black Robes founded missions, established horticulture and agriculture, built substantial churches, to the admiration of globe trotters today, and contributed to the permanent colonization of two-thirds of the difficult region, at that time dubbed in Europe the "most outlandish place in the world."

Meanwhile permanent European civilization made a steady advance up the West Coast mainland at the foot of the impassable Sierra Madre Occidental.

Guzmán had accomplished much at Culiacán, and he deserves a better place in history than the one to which he has been assigned. Ibarra, founder of Durango and Chihuahua, in 1564 crossed the Sierra Madre in a winter so severe that his horses froze to death standing in their tracks, and gave new life to the Sinaloa settlements. Soon the frontier advanced north to Sinaloa River, then to the Fuerte, the Mayo, the Yaqui, and on to the Sonora River.

The West Coast Corridor was a land of miners, cattle men, farmers, pearl fishers, and missionaries. After a brief attempt by the Franciscans the Jesuits took over in 1591 and labored continuously on the Corridor for the next one hundred and sixty-six years—that is about as long as from the Declaration of Independence to now.

River by river, valley by valley, canyon by canyon (one of them as deep as Grand Canyon) these harbingers of Christian civilization advanced into the realm of heathendom. They gathered the natives into villages, indoctrinated them in the Faith, trained them in agriculture and the crafts, and in schools taught many of them reading, writing, and music. Under the tutelage of the patient Jesuits, barbarians who formerly had constructed only the meanest huts now built substantial and beautiful churches, some of which still stand as architectural monuments. The natives were generally well disposed toward the missionaries. But secular Spaniards exploited their labor in mines and on haciendas, and medicine men were jealous of their white competitors. The result was a series of periodic Indian revolts in which a number of Black Robes won the crown of martyrdom. But the march went on.

It was a picturesque pageant. Black Robes moved into the wilderness beside or ahead of the prospector, miner, soldier, and frontier trader. Land travel was chiefly on horseback, muleback, or on foot, and land transportation by pack train or Indian carriers. As the frontier expanded, here and there a town, a mining camp, an hacienda, a garrison was pitched on the border of settlement. Still beyond in the midst of heathendom, Christian missions were planted. As the Spaniards advanced northward, the Indians were reduced to sedentary life. When Pérez de Ribas published his *Triumphos de Nuestra Santa Fé* in 1645 the Jesuit showing for half a century of labor was most impressive. West of the Sierra Madre, in a stretch of some six hundred miles, there were now thirty-five head missions, each with from one to four towns, perhaps a hundred in all. The mission books showed a total of more than 300,000 baptisms in the West Coast Corridor to date. The presidio of San Felipe, the principal garrison, had a force of only forty-six soldiers. This fact alone "shows how completely the natives had accepted missionary control."

The chief economic resources of the Corridor were stock raising, agriculture, fruit culture, and mining. Great herds of cattle, horses, sheep, and goats roamed the plains and foothills. Prospecting for mines was a favorite pursuit. Some of the mining ventures were successful on a large scale. At Rosario, near Mazatlán, in the eighteenth century the output of gold found expression in the building of enormous and luxurious palaces, still today decorated with classic mottoes over their spacious portals. In recent times gold digging has completely undermined the old city and the palaces are falling into their own cellars.

A rich silver strike was made at Alamos, near Mayo River, in 1686. There was a grand rush, and

the camp became a substantial city, now almost deserted, but leaving a costly church, a fine civic center, and solid business blocks of beautifully worked stone and marble, as a monument to the wealth and culture of a bygone day. Farther north in Sonora a score of mining towns were founded and flourished in the seventeenth and eighteenth centuries. Cananea, near the United States line, has been active and prosperous down to the present time. Just over the border from Nogales were found in the eighteenth century silver nuggets weighing tons, among the largest on record. Southern Arizona, until the Mexican War a part of Sonora, is still an important mining region.

The West Coast Corridor produced men who were men. Among them was club-footed Hurdaide of Sinaloa who was feared by hostile Indians, and to command the obedience of the most warlike chief, he had only to send out a paper stamped with his wax seal, a symbol known far and wide. On the northern border the Anzas, father and son, were long the masters of the Sonora-Arizona border—defenders of the frontier against the hostile Apaches who were a terror to civilians.

In the middle eighteenth century the Russian bear cast his shadow over Spain's holdings on the Pacific coast. Thereupon José de Gálvez, Visitor General, proceeded to colonize Upper California. Portolá led soldiers and Franciscan missionaries to settle San Diego and Monterey. Six years later a colony was raised in Sinaloa and Sonora, led overland by stalwart Anza, to occupy the great harbor of San Francisco Bay, just when the English in Philadelphia were declaring their independence. San Franciscans and Philadelphians alike commemorate that significant year, 1776, we in the West for two good reasons.

HIGH ALTITUDE RESEARCH WITH V-2 ROCKETS

ERNST H. KRAUSE

Naval Research Laboratory

(*Read April 25, 1947*)

THE study of the heavens is an ancient science. It began with speculation about the movement and constitution of the sun; later it moved into the greater universe of the stars;[1] and more recently it expanded into that small but very interesting region of space represented by the earth's atmosphere.[2] It seems fitting that a review of the more modern aspects of this subject should be made here since Franklin himself, the founder of the American Philosophical Society, made some of his more important contributions to science in this field.[3]

The atmosphere of the earth is a very complex affair. Many things are known about it and yet the over-all picture is beclouded by lack of sufficient information of the various mechanisms involved to tie all of the observed phenomena into one unified picture. The presence of the lower atmosphere makes the study of phenomena in the upper atmosphere very difficult and in many cases impossible. Similarly, the existence of the atmosphere sets very definite limitations on studies in such fields as astrophysics and cosmic rays, while on the other hand the atmosphere provides us with many new phenomena to study, such as the ionosphere, the aurora, etc.

The answer to many of these difficulties is to study the phenomena within the atmosphere at those points where they occur and to make astrophysical and other studies from above the atmosphere. A step in this direction was the exploitation of the balloon as a vehicle. The balloon, however, has two serious shortcomings. First, it has a maximum ceiling between 30 and 40 km. Many observations have been made up to these altitudes by means of balloons, but a great deal of data is desired above these altitudes. Second, the payload capabilities of balloons are limited to the order of 100 pounds, unless one makes use of complicated balloon formations or of very large balloons such as were used in the *Explorer* flights.[4,5] Both of these difficulties can be solved by the use of rockets which are not limited in ceiling, and, although there are payload limitations, the problem of carrying 1,000 pounds to altitudes of 200 km or more is perfectly feasible.

Although rockets themselves date back many centuries, the utilization of one which would carry sufficient weight to conduct an experiment did not seem practical up to the beginning of the last war. However, with the advent of the war, a tremendous impetus was given to rocketry because of its usefulness as a military device, so that several rocket-powered vehicles emerged from the war which could reach altitudes greatly in excess of any that had been reached before. Of these devices, the V-2, designed and built by the Germans, was well out in front. Not only did it reach altitudes much greater than any previously attained by rockets or by other means, but it also was sufficiently large that it could carry a payload much greater than any research worker had hoped for.

The work on the upper atmosphere utilizing the German V-2's in this country has been going on for a little more than one year. Even in so short a time it can be stated that the V-2 has already made important contributions to such fields as solar spectroscopy, cosmic rays, and the measurement of atmospheric pressures and temperatures.[6,7,8,9] To those of us in the field, it is somewhat surprising, but nevertheless gratifying, that

[1] Shapley, H., and H. E. Howarth, *A source book in astronomy*, N. Y., McGraw-Hill, 1929.

[2] Hulburt, E. O., Upper atmosphere of the earth, *Jour. Opt. Soc. Amer.* **37**: 405, 1947.

[3] Fleming, J. A., *Terrestrial magnetism and electricity*, 149, N. Y., McGraw-Hill, 1939.

[4] O'Brien, Brian, Vertical distribution of ozone in the atmosphere, part one: Spectrographic results of the 1934 flight, *N. G. S. Contrib. Tech. Papers, Stratosphere Series* **2**: 49, 1936.

[5] O'Brien, Brian, Fred L. Mohler, and H. S. Stewart, Jr., Vertical distribution of ozone in the atmosphere, part two: Spectrographic results of the 1935 flight, *N. G. S. Contrib. Tech. Papers, Stratosphere Series* **2**: 71, 1936.

[6] Upper atmosphere research report no. I, *Naval Research Lab. Rept.* R–2955, 1946.

[7] Newell, H. E., and J. W. Siry, Upper atmosphere research report no. II, *Naval Research Lab. Rept.* R–3030, 1946.

[8] Upper atmosphere research report no. III, *Naval Research Lab. Rept.* R–3120, 1947.

[9] Upper atmosphere research report no. IV, *Naval Research Lab. Rept.* R–3171, 1947.

the early experiments have proved so successful. We had anticipated that the complexities involved in perfecting the necessary new techniques could easily have consumed the first year's work.

First, I would like to say a few words about the organization of a project as large as this. There is no one organization that encompasses the entire project. The V-2's themselves are assembled, made ready to fire, and fired by the Army Ordnance Department with the aid of the General Electric Company under a special contract for this purpose. Once the V-2 has been fired, it is of course very important to know where it is at all times in its trajectory, so that data taken can be correlated against altitude, range, etc. The ballistics and the problem of tracking in general, involving many types of radio, radar, and optical methods, are the responsibility of the Ballistic Research Laboratories of the Aberdeen Proving Ground.

The actual upper atmosphere work is conducted by various institutions including the Air Materiel Command, involving the University of Michigan and Watson Laboratories, the Applied Physics Laboratory of the Johns Hopkins University, the Signal Corps, and the Naval Research Laboratory. In addition, there are numerous other contributing agencies, including Princeton University, the National Bureau of Standards, Harvard University, and California Institute of Technology. All of the work is coordinated through a V-2 Panel which consists of members from most of the above named institutions and agencies.

THE V-2

Just to refresh your memories I might point out a few of the characteristics of the V-2.[10] Figure 1 shows the V-2 on its launching platform. It stands about 46 feet high, has a total weight of 28,000 pounds when fueled and 9,000 pounds empty. The total weight of payload carried is about 2,000 pounds. Its diameter is 65 inches. Stabilization is accomplished by a set of carbon vanes placed in the jet, aided by a set of air vanes in the fins. Fixed gyroscope stabilization is maintained in azimuth, and a gyroscope program control feeds a predetermined tilt program to the fins. When the rocket motor is started, the rocket begins to rise slowly as soon as the acceleration due to the thrust exceeds 1 g. Since a rocket motor of this type is a constant thrust device and since the mass is constantly decreasing owing to fuel consumption, the acceleration gradually increases until after about 60 seconds it reaches a value of 6 g. At this point the fuel is completely consumed, the missile is out of the denser atmosphere and it proceeds on a trajectory which is a function only of its position and velocity at the time of fuel burnout. Up until the time of burnout it is, as previously pointed out, completely stabilized. Thereafter, since it is out of the atmosphere and since no more jet power is available, no further stabilization is obtained. The result is that any accidental angular momentum imparted during the fuel burnout period produces a roll, pitch, or yaw during the remainder of the free-space flight.

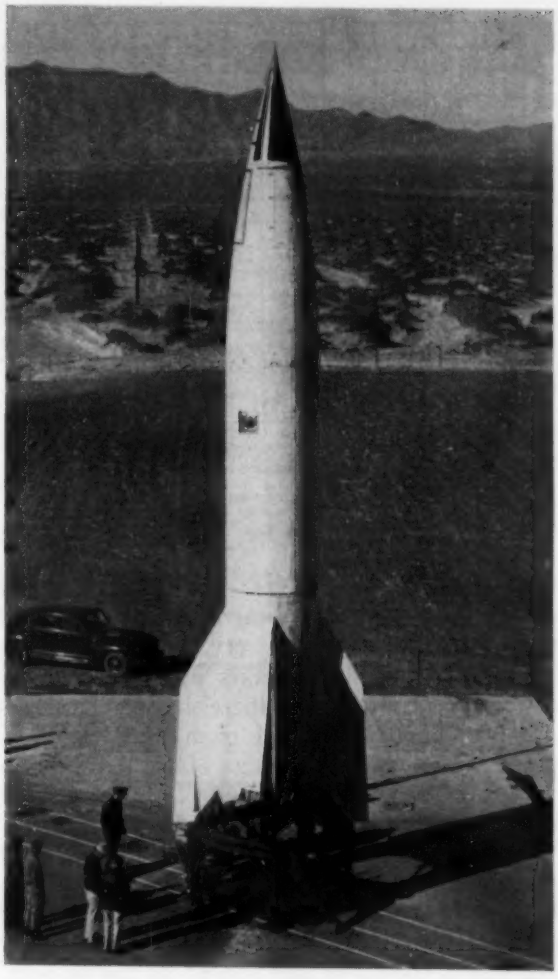


FIG. 1. V-2 on its launching platform. Note the camera opening in the midsection and also the special painting on the warhead to facilitate recovery.

[10] Smith, C. H., Jr., Upper atmosphere research report no. I, chap. I, General description of V-2 and the firing program of the Army Ordnance Department, *Naval Research Lab. Rept.* R-2955: 7, 1946.

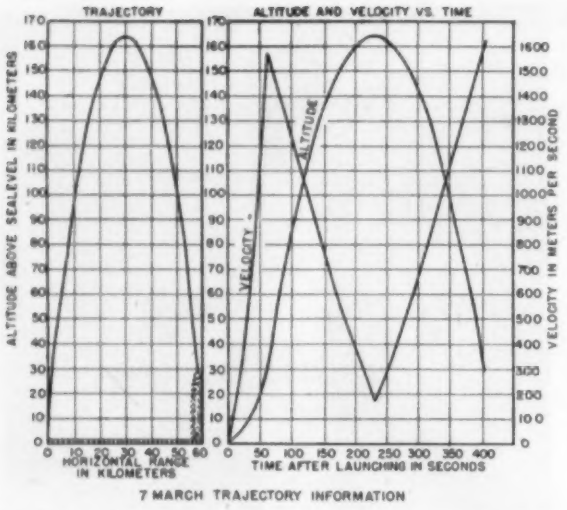


FIG. 2. Trajectory curves for 7 March 1947 flight.

Here we encounter the first objectionable feature of the V-2 rocket as a research vehicle. We find that, in general, there is a very definite roll about the rocket's longitudinal axis over most of the trajectory. In addition there have been cases where a definite yaw and pitch have been observed. The exact knowledge of the missile's attitude after burnout is not complete at present but is the subject of an intensive study.

Figure 2 shows the trajectory of the V-2 as it was plotted for a firing on March 7, 1947. A study of this trajectory brings out a second shortcoming of the rocket in general, that is the short time that it spends in free space. It can be seen, for example, that the time the rocket spends above 50 km is about 5 minutes. It is therefore necessary to complete all experiments in this limited time.

To conduct work in the V-2 it was necessary to design and build a special warhead with access doors for installing and adjusting the equipment. It is not a standard device but usually undergoes special modification for each flight, depending on the particular experiments involved.

DATA RECOVERY

Two general methods of data recovery are used. One involves telemetering (radio transmissions of data from the missile to the ground); the other involves direct recording of information on film or other recorders, followed by physical recovery of the equipment after impact.

Of these two general methods by far the more successful has been that of telemetering. The telemetering system which has been employed in all V-2 firings is a 23 channel pulse time modulated system designed at the Naval Research Laboratory.[11] The information is transmitted by means of a group of pulses such that the intelligence on any given channel is contained in the spacing between two adjacent pulses. Twenty-four such pulses constitute one group for a 23-channel system. The group repeats at a rate of approximately 200 cycles per second; hence each channel is sampled at this rate. Figure 3 shows the complete telemetering unit in its pressurized container. Pressurization is, of course, necessary to avoid arc-over and corona at the lower pressures which the missile passes through. The system uses subminiature tubes, operates at a frequency of approximately 1,000 mc, and has a peak power output between one and two kw. The entire record of a flight is recorded on the ground by several different methods, the most important of which is a string oscillograph. A picture of a typical recording is shown in figure 4.

[11] Heeren, V. L., C. H. Hoeppner, J. R. Kauke, S. W. Lichtman, and P. R. Shifflett, Telemetering from V-2 rockets, *Electronics* **20**: 100–105, 1947.

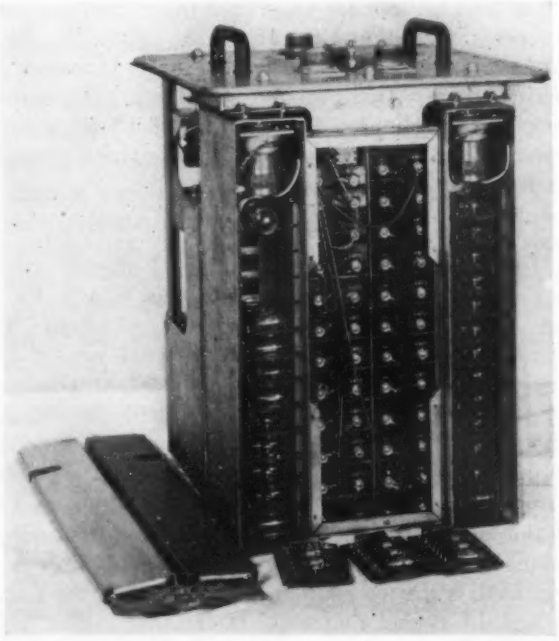


FIG. 3. Telemetering transmitter removed from its pressurized container. The circuitry for each of the 23 channels can be quickly unplugged for servicing. The two motors at the top are used for periodically transmitting calibrating voltages while in flight. Note the almost exclusive use of subminiature tubes.

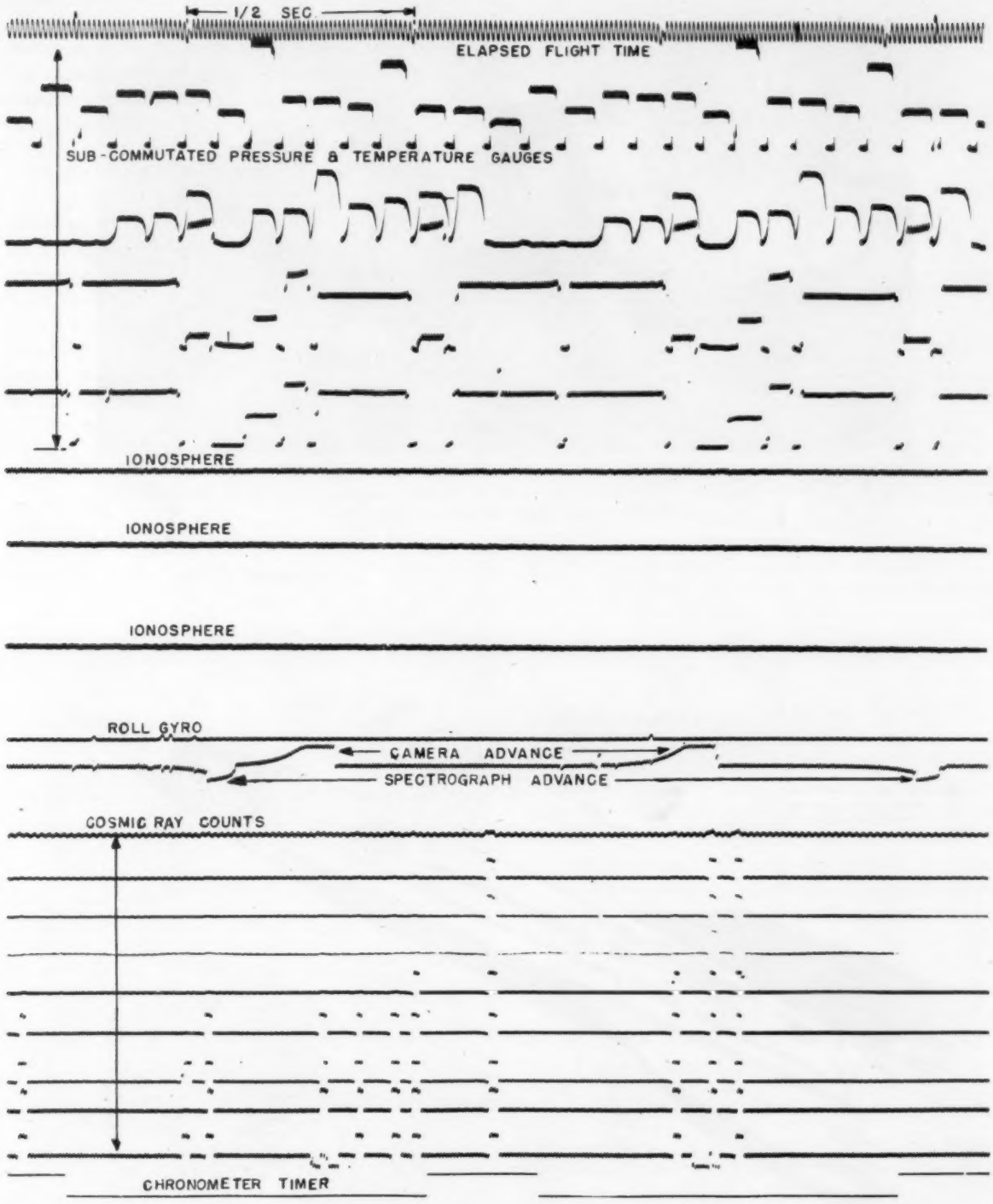


FIG. 4. Typical section of telemetering record. Top and bottom of the record are timing signals. The subcommutated channels at the top of the record represent different types of pressure and temperature information, each individual deflection corresponding to a different gauge. The ionosphere channels at this time in the record present essentially direct information. The roll gyroscope shows no roll since the missile is still in its stabilized period. The rest of the record is self explanatory.

FIG. 5. V-2 after impact. The chances of recovery of film cartridges and other recorded data from the missile after impact are very good.

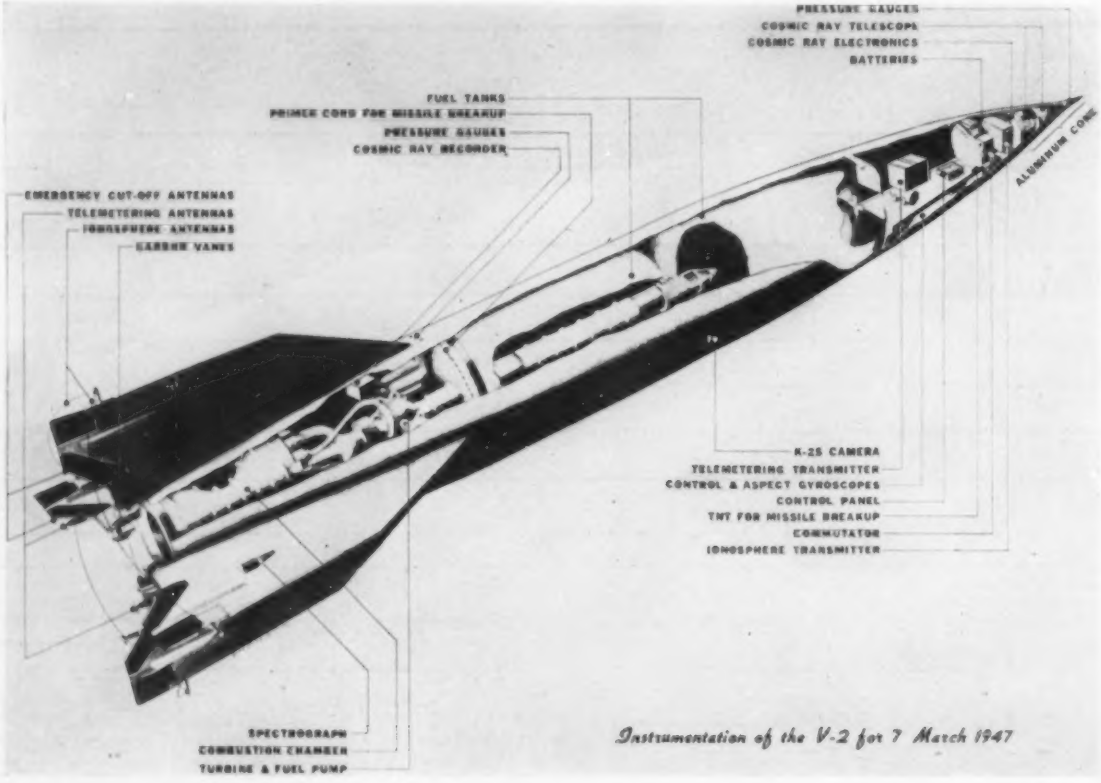


FIG. 6. Cutaway sketch of the V-2 as it is used for upper atmosphere research.

We have under development and should have in use within the next six months a 30-channel telemetering system using a 300-cycle sampling rate.[12] By means of a subcommutator we will be able to extend the number of channels to 450 using a sampling rate of approximately one per second.

The recovery of data by telemetering is not completely satisfactory in all cases. For example, the telemetering of spectrographic data, although possible, is not very satisfactory. Furthermore in all cases when the missile begins to gyrate severely, as it does occasionally, the telemetered data is not continuous because the antenna is at times completely shadowed by the missile. For these reasons other methods of data recovery are being studied. One of these methods is the use of drag mechanisms, including parachutes.

The use of drag mechanisms for recovery is probably feasible, but considerable development work still needs to be done. The present method of recovery involves breaking up the missile during its downward flight in such a way that each individual piece coming down has a high drag coefficient and very poor stability, the result being that the piece in question will tumble or float down. It has been found by this method that equipment even after very high flights will arrive at the earth in fair condition, and occasionally will be found completely intact. Thus, for example, on our October 10 flight, the spectrograph which was installed in a tail fin, was recovered in such a good condition that further calibration runs were made on it in the Laboratory without readjustment. The induced break-up had torn the fin loose and it had apparently floated back to the earth. Eight pounds of TNT tied to the beams supporting the warhead are usually used to produce blowoff. The correct time of detonation is obtained by means of a timer mechanism and also by means of radio such that the TNT is detonated by the appropriate one of these two methods at an altitude of about 60 km above the earth on the downward flight. A photograph of a V-2 after a 170 km high flight is shown in figure 5. By this means we have to date recovered four spectro-

[12] Lichtman, S. W., J. T. Mengel, and C. R. Smith, Upper atmosphere research report no. IV, chap. XI, The telemetering system, *Naval Research Lab. Rept.* R-3171, 1947.

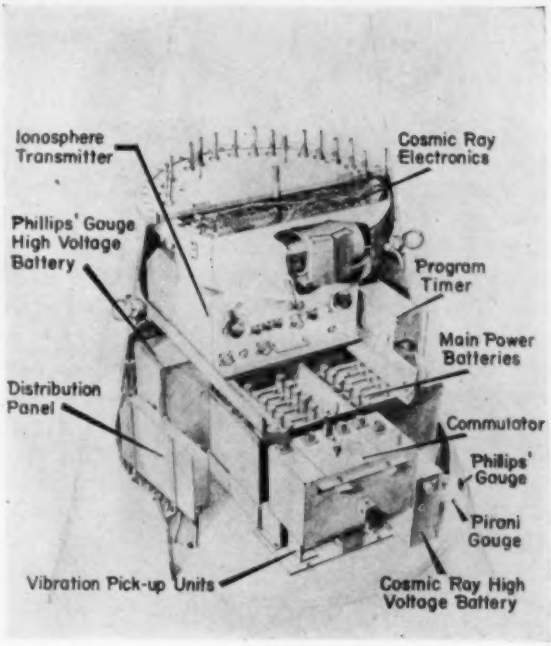


FIG. 8. Sketch showing bottom half of warhead, including cosmic-ray electronics, ionosphere transmitter, various pressure gauges, and miscellaneous equipment.

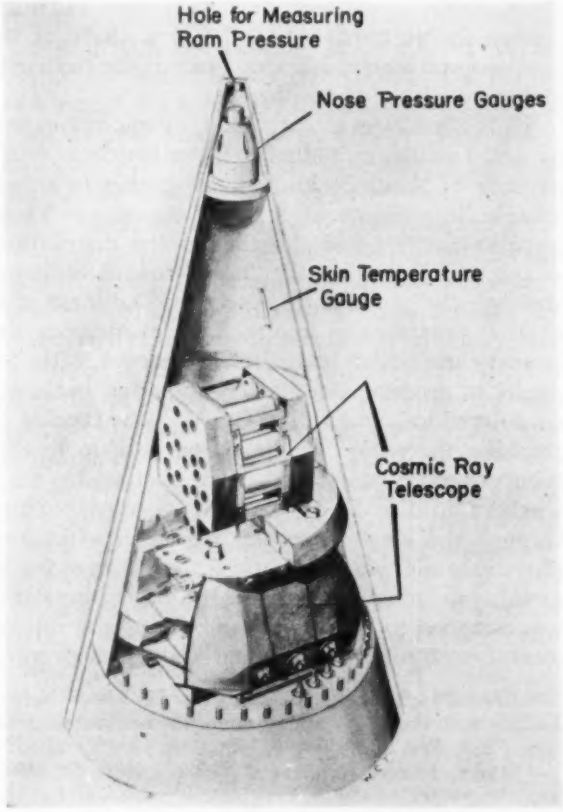


FIG. 7. Sketch showing the forward section of the warhead, including ram pressure gauges, skin temperature gauges, and cosmic-ray telescope.

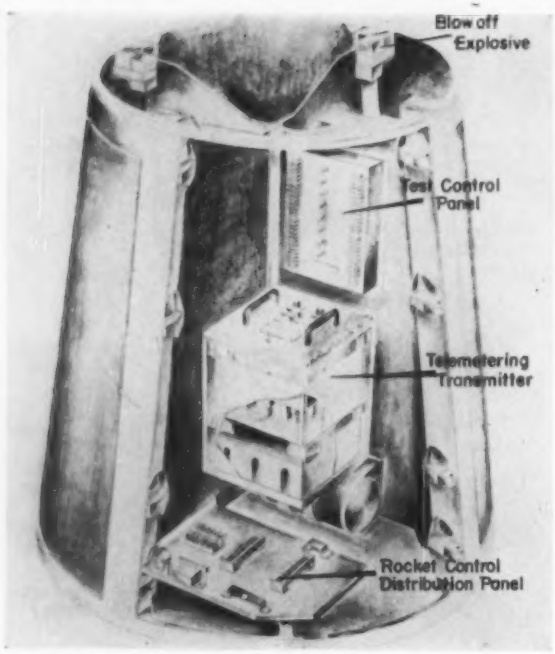


FIG. 9. Sketch showing chamber below warhead including telemetering transmitter and distribution panel.

graphs (two in usable condition), three photographic recorders, four still picture cameras and ten motion picture cameras, most of which went to an altitude of 170 km. In all cases the films were in excellent condition, even though in some cases no precautions were taken to protect them on impact.

Our present program is concerned with four fields of high altitude research, namely, cosmic rays; the ionosphere; pressure, temperature, and composition measurements; and astrophysics involving primarily the spectrum of the sun. A typical layout of these various experiments in a V-2 is shown in the sketch of figure 6. A more detailed view of the installations in the warhead and control chamber is shown in figures 7, 8, and 9. Beginning at the extreme nose tip of the missile we have an installation for measuring ram pressures. Immediately behind this in the warhead is the cosmic-ray telescope with the necessary electronics below the telescope. The ionosphere transmitter is directly below the cosmic-ray electronics. Also in the warhead are a timer, remote control switching panel, accelerometers, telemetering commutator, batteries, and miscellaneous equipment. In the control chamber immediately behind the warhead are the telemetering transmitter, several distribution and testing panels, and the TNT for blowing off the warhead. In the midsection between the alcohol and oxygen tanks, two cameras are mounted for taking pictures at intervals on the way up. The cosmic-ray film-recording camera is mounted on one of the motor supports immediately below the oxygen tank. The spectrograph is mounted in one of the fins and is provided with a fairing to maintain the necessary streamlining of the fin. At the extreme tail end of the missile are mounted the various antennas for telemetering, ionosphere, and emergency cutoff equipment. I should now like to discuss each of the various experiments at greater length.

COSMIC RAYS

There are many cosmic-ray experiments that one can perform even in a rocket which spends only four or five minutes above the atmosphere. Of all the possibilities we felt that two stood out above all others, namely, (1) a determination of the nature of the primary radiation (heretofore the nature of the primaries could be inferred only from studies of the secondary or tertiary radiation within the atmosphere), and (2) a study of the fundamental reactions taking place as the primaries pass through the atmosphere.

Until the advent of the rocket, cosmic-ray experiments had been conducted in balloons up to an altitude of about 24 km, corresponding to an atmospheric pressure of 2 cm of mercury. These experiments[13, 14] had determined the distribution of the total as well as the "hard" cosmic radiation through the atmosphere, and they indicated that even at pressures as low as 2 cm of mercury the primary radiation had already reacted with air nuclei to produce a secondary radiation generally considered to be mesons. The V-2 was capable of reaching the region of the primaries (up to this time generally considered to be protons by most workers in the field[14, 15]) and also of passing through the very interesting region in which the ultranucleonic transformations, which result in meson production, take place. One of the latter was assumed to be the very important and fundamental proton-meson reaction about which very

[13] Bowen, I. S., R. A. Millikan, and H. Victor Neher, New light on the nature and origin of the incoming cosmic rays, *Phys. Rev.* **53**: 855–861, 1938.

[14] Schein, Marcel, William P. Jesse, and E. D. Wollan, The nature of the primary cosmic radiation and the origin of the mesotron, *Phys. Rev.* **56**: 615, 1941.

[15] Johnson, T. H., Composition of cosmic rays. Evidence that protons are the primary particles of the hard component, *Rev. Mod. Phys.* **11**: 208, 1939.

little is known, since it apparently occurs on earth only in the cosmic radiation at the top of the atmosphere.

Four different cosmic-ray experiments have been successfully performed to date in four different flights.[16, 17, 18, 20, 21] At the present time three more experiments are in preparation for incorporation in flights during May and July 1947. The results of these experiments have given more insight into the nature of the cosmic radiation. The first two experiments established the fact that the greater portion of the primary radiation consists of "hard" particles (i.e. particles which will penetrate at least 12–15 cm of lead) and that about one out of every five such particles will produce a shower in 12 cm of lead. In addition it was found that large showers were produced by the primaries in the rather considerable mass of material in the warhead which surrounded the counter telescope. On the basis of this information the third and fourth experiments were performed which I should like to discuss in greater detail.

The third experiment[18] consisted of two parts. In the first part a cosmic-ray telescope was arranged to test the penetrating properties of the incoming ionizing radiation. It was found that (at a zenith angle of 45°) about 60 per cent of the radiation was absorbable in a large thickness of lead (14 cm). The other properties of the high altitude radiation were again verified, i.e., the large numbers of warhead showers, and the showers under 14 cm of lead (28 per cent in this measurement). The second part of the experiment, conducted in the same flight, tested for penetration through two successive lead plates each only 2 cm thick. It was then found that about 35 per cent of the high altitude rays were stopped in either the first plate or penetrated it and stopped in the second. This indicated that at least this component was not primary (if the improbable case is excluded that it consisted of nuclei of high atomic number). It has been suggested[19] that these are electrons which arise from the atmosphere below and are due to meson decay. The ones observed presumably originated above South America and spiraled around the earth's magnetic field lines to reach the point of observation. The remainder of the radiation (i.e. 65 per cent) was observed to penetrate the 4 cm of lead, some of it producing showers in either the first plate, the second plate, or both. An upper limit to the relative number of primary electrons is obtainable from these data. First, it cannot be greater than 65 per cent minus 40 per cent or 25 per cent of the total radiation (including the non-primary electrons). Second, it must be less than the relative number of events in which showers were produced below 2 and 4 cm, since some of these are ascribed to particles of high penetrating power. This reduces the possible number of primary electrons to 9 per cent of the total or 18 per cent of the primary radiation.

The fourth experiment[20] consisted of a counter tube telescope arranged so that the percentage of particles penetrating 2 cm, 6 cm, and 12 cm of lead could be determined. The number of three-fold showers under these same thicknesses was also measured. The telescope was mounted vertically

[16] Golian, S. E., E. H. Krause, and G. J. Perlow, Cosmic radiation above forty miles, *Phys. Rev.* **70**: 223, 1946.

[17] Golian, S. E., E. H. Krause, and G. J. Perlow, Additional cosmic-ray measurements with the V-2 rocket, *Phys. Rev.* **70**: 776–777, 1946.

[18] Perlow, G. J., and J. D. Shipman, Jr., Non-primary cosmic ray electrons above the earth's atmosphere, *Phys. Rev.* **71**: 325, 1947.

[19] Wheeler, J. A., Private communication of August 26, 1946.

[20] Golian, S. E., and E. H. Krause, *Phys. Rev.* **71**: 918, 1947.

[21] Howland, B., C. A. Schroeder, and J. D. Shipman, Jr., Electronics for cosmic-ray experiments, *Rev. Sci. Instr.* **18**: 551, 1947.

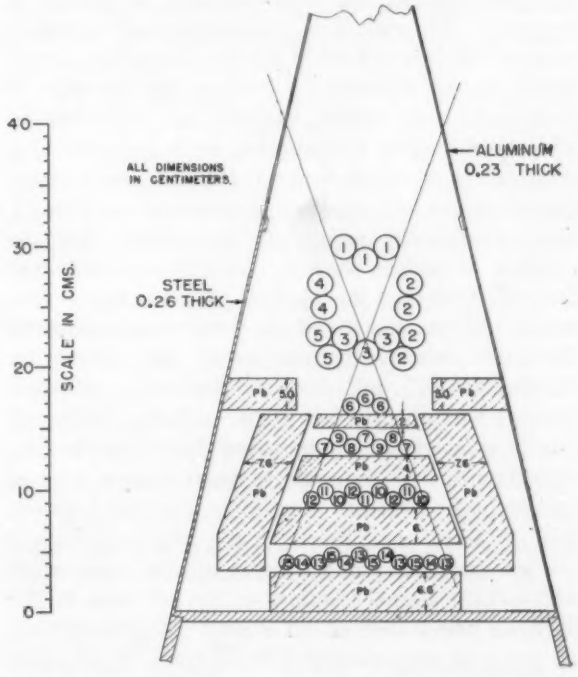


FIG. 10. Schematic of counter telescope arrangement in warhead for the 7 March 1947 missile.

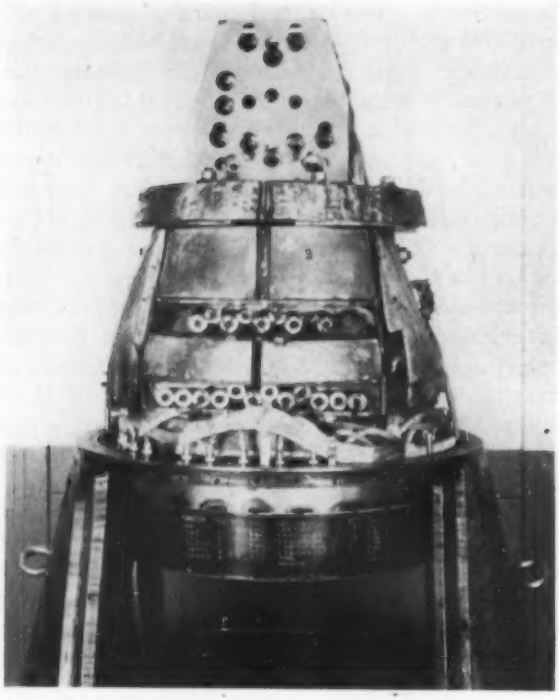


FIG. 11. Photograph of cosmic-ray telescope in 7 March 1947 missile.

in a specially designed warhead so that it looked directly through the warhead nose as shown in figures 7, 10, and 11. The heavy lead shielding around the lower half of the telescope was introduced in an attempt to reduce the number of rocket showers found in previous experiments. This shielding, in conjunction with the absorbing lead plates, was sufficient to eliminate most of the registered rocket showers of primary or non-primary electronic origin. It was found that the number of rocket showers actually doubled over that of previous unshielded experiments. This would indicate that these showers must be of non-electronic origin. It was found that, above the atmosphere, 25 per cent of the total radiation present was absorbed in 6 cm of lead. Although this is somewhat less than that found in the first experiment, it is assumed to be the same type of non-primary electron component discussed above. The different percentages in the two experiments are attributed to the variation of this component with zenith angle. A total of 59 per cent of the particles penetrated 12 cm of lead. The remaining 16 per cent was absorbed in 12 cm. In all cases the larger portion did not produce showers under the lead. Thus, primary electrons would be ruled out since these would produce large showers under 2 and 4 cm. As a matter of fact it is difficult to understand how any of this component could be due to primary particles since the large energies associated with the primaries should produce some type of reaction below 12 cm of lead unless, of course, neutral particles are involved. If we assume that all of the radiation except that absorbed in 6 cm is primary, then we find that the electron component determined on the basis of shower production could not be more than a maximum of 14 per cent of the primary; the non-electronic component absorbed in 12 cm is 18 per cent of the primary and the non-electronic component penetrating 12 cm is 68 per cent of the primary. The ratio of the total radiation in free space to that at sea level was 11.5. The ratio of the hard component (that which penetrated 6 cm of lead) in free space to that at sea level was 9.0.

ASTROPHYSICS AND COMPOSITION

Because the earth's atmosphere had limited spectroscopic observations of the sun to a lower wavelength limit of 2863 A,[22] astronomers have long

[22] Pettit, Edison, Measurements of ultra-violet solar radiations, *Astrophys. Jour.* **75**: 185–221, 1932.

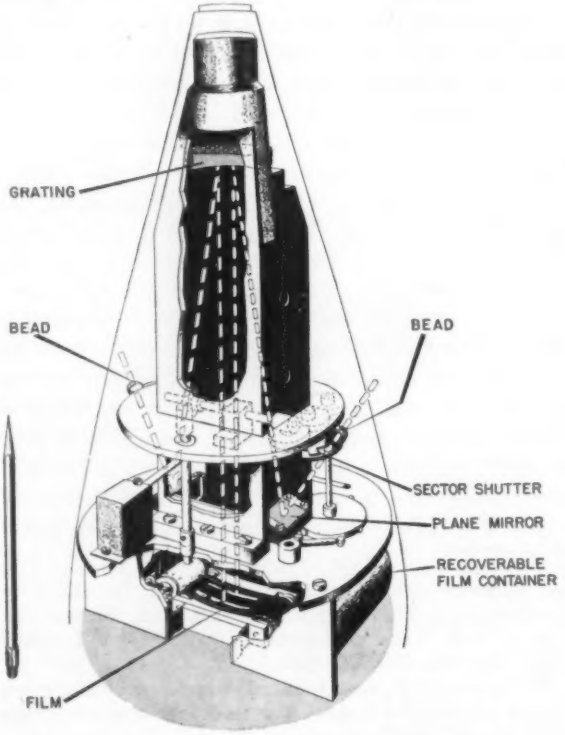


FIG. 12. Sketch of spectrograph designed for use in the V-2.

been looking forward to the time when the unknown far-ultraviolet region could be observed. Even though balloons could reach altitudes of 30 km they were not quite able to pierce the ozone layer and, because of the ozone absorption band which lies just below 2900 A, the lower wavelength limit observed at 30 km was about the same as it was at sea level.[23]

A rocket which reached altitudes of 170 km and higher should prove very valuable in further solar spectral studies. To get such a spectrum and at the same time to get more constructive information on composition of the atmosphere, a special vacuum grating spectrograph, shown in figure 12, was designed to fit into the V-2.[6] Two small lithium fluoride beads are used for obtaining a wide angle of view so as to minimize the effect of roll and other movements of the missile. The image from this little bead is reflected to a grating and in turn to a 35 mm film on which the images from the two beads are recorded separately. The spectrograph was originally designed to fit in the nose of the warhead but, because of greater ease of recovery, it has been, in more recent flights, mounted in one of the tail fins. As pointed out previously, spectrographs have on several occasions been recovered in such good condition that they were capable of being used again.[24]

[23] Regener, Von Erich, and Victor H. Regener, Aufnahmen des ultravioletten Sonnenspektrums in der Stratosphäre und vertikale Ozonverteilung, *Phys. Ztschr.* **35**: 788–793, 1934. (See also references 4 and 5.)

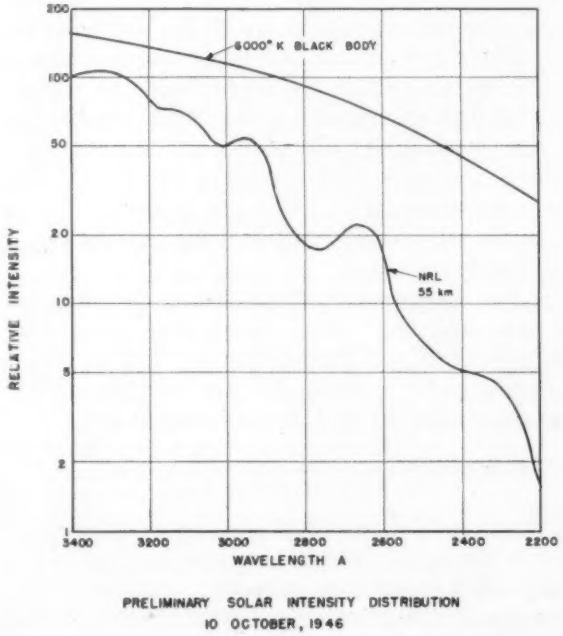


FIG. 13. Solar intensity distribution obtained from spectra of 10 October 1946. (These data are preliminary since the analysis of all spectra is not yet complete.)

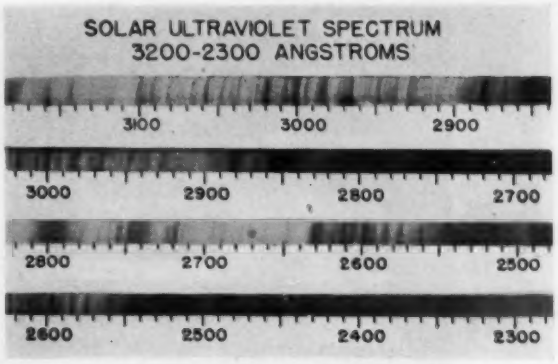


FIG. 14. Fraunhofer spectrum obtained in the 7 March 1947 missile. This is the first time the region below 2900 A has been photographed with such high resolution.

Two successful experiments have been conducted to date in solar spectroscopy with the result that nearly 100 spectra have been obtained at various altitudes up to 160 km.[24, 25] The spectrograph (similar ones were used in the two flights) was arranged to record only the wavelengths below 3400 A; in some of the spectra obtained at higher altitudes radiation was recorded down to 2100 A. Analysis of these spectra has produced the following results.

1. Solar Spectral Energy Distribution. The curve of average radiant energy as a function of wavelength—the so-called black-body curve of the sun—was extended from the previous limit of 2900 A to 2200 A shown in figure 13. The ultraviolet intensities are much less than had been predicted.[26]

2. Fraunhofer Line Analysis. A large number of fully and partly resolved absorption minima were observed in the region between 2950 and 2300 A, as shown in figure 14. Nearly all observed minima are blends from two or more closely spaced lines, but the principal contributors have, in many cases, been identified. Of particular in-

[24] Baum, W. A., F. S. Johnson, J. J. Oberly, C. C. Rockwood, C. V. Strain, and R. Tousey, Solar ultraviolet spectrum to 88 kilometers, *Phys. Rev.* **70**: 781, 1946.

[25] Durand, E., J. J. Oberly, and R. Tousey, Solar absorption lines between 2950 and 2200 ängstroms, *Phys. Rev.* **71**: 827–828, 1947.

[26] Durand, E., and R. Tousey, Upper atmosphere research report no. III, chap. II, *Naval Research Lab. Rept.* R-3120: 10, 1947.

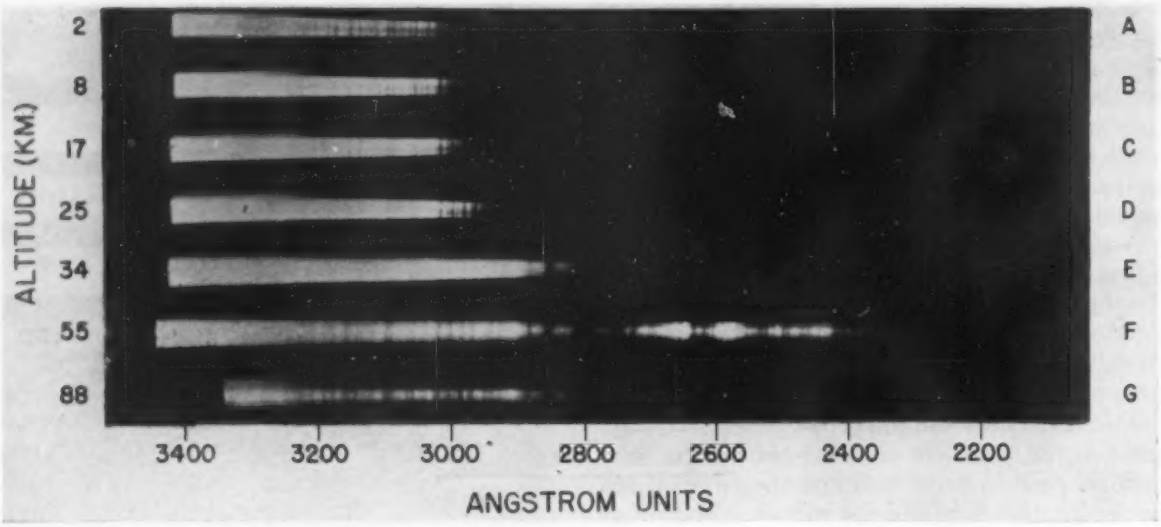


FIG. 15. Composite spectra showing ozone absorption band. The spectrum at 88 km actually extends as low in wave length as does that at 55 km but because of lower intensity it did not reproduce in the print.

terest was the appearance of the Mg II doublet at 2795 and 2802 A as bright emission lines in the center of a broad absorption region created by the same pair.[25]

3. Line Shapes. Line widths and intensities are important in determining excitation conditions in the sun, and necessary to an understanding of the fundamental processes occurring there. Considerable information on this subject is contained in the spectra. Full analysis and evaluation of conditions in the sun will require another year or more of intensive work.

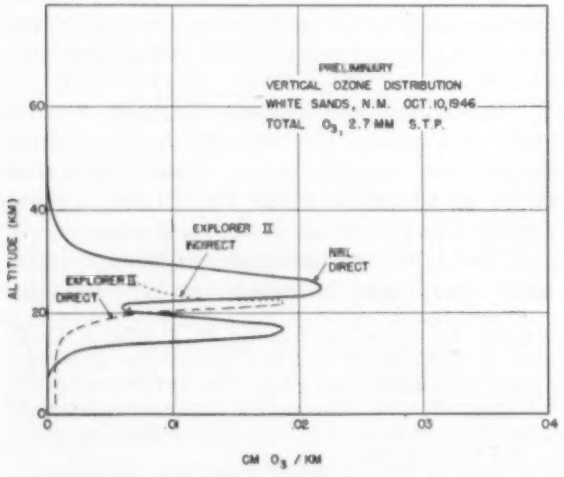


FIG. 16. Vertical ozone distribution. The double layer is rather unusual but has been reported previously.

4. Ozone. The variations of the spectra with altitude for the 10 October flight are shown in figure 15. The effect of the absorption of ozone can be clearly seen by noting the absorption band in the region of 2300 to 2800 A below 55 km. The vertical distribution of ozone on this flight is shown in figure 16.[27] The results of the 1936 *Explorer II* balloon flight[5] are shown for comparison. The balloon data above 22 km are based on an indirect method and lack the inherent accuracy of the direct method employed from the rocket. Further data are required to determine whether the disagreement at high altitudes is due to a real variation in the ozone or to experimental error. The lower maximum is known to be present on days when the total ozone content of the atmosphere is abnormally high.[28]

5. Sky Brightness. Some data in the ultraviolet are available. The experiments were not, however, designed particularly for this problem.

Future experiments in this field will aim at still lower wavelengths and greater resolution.

PRESSURE AND TEMPERATURE EXPERIMENTS

Actual measurements of pressure and temperature in the upper atmosphere have been made for many years by various methods. Balloons regularly obtain this information up to 30 km. Above

[27] *Ibid.*, 11.

[28] Gotz, F. W. P., Der Stand des Ozonproblems, *Vjs. Naturf., Ges. Zurich* **89**: 250, 1944.

this altitude various indirect methods have been used, including measurements on meteors,[29] sound range measurements of large explosions,[30] and others.[2]

Although we have a vehicle which will carry us to an undreamed of altitude, the problem of measuring such basic quantities as pressure and temperature from a missile which is moving at a velocity of 1 mile a second is far from easy. This becomes clear when one calculates the adiabatic temperature rise on a thin piece of material placed on the nose of the V-2. For the velocities involved this temperature is higher than 1000° C.

Our attack on the problem to date has been to measure the so-called ram pressure at the nose of the missile and the pressure at a point on the side of the missile at which, according to wind tunnel tests, the pressure is within a very small percentage of ambient. Since a pressure range of 10^8 is covered in a normal flight, it is necessary to use various types of gauges. The range from atmospheric pressure down to about 1 cm of mercury is covered with a bellows gauge; the range of 2 cm mercury to 10^{-3} mm mercury is measured with Pirani gauges[31] while the region of 10^{-3} to 10^{-5} mm mercury is studied by means of Philips gauges[32] and ionization gauges.[33] The most complete measurements to date were obtained on flights in October 1946 and March 1947.[34, 35]

I would like to discuss briefly the March flight in which a total of 15 pressure and 2 skin temperature gauges were installed. Ambient pressures were measured up to about 80 km with gauges mounted on the side of the V-2, just forward of the tail section. Pirani gauges mounted in similar positions on opposite sides of the rocket gave readings which agree within experimental errors, indicating that no appreciable error was introduced by yaw of the missile up to this altitude. A single Philips gauge was mounted on the 15° cone of the warhead. The readings of this gauge, when reduced to ambient pressures by use of the theories of Taylor and Maccoll,[36] gave values up to 120 km altitude. Pressure measurements obtained by these two methods are shown in figure 17.

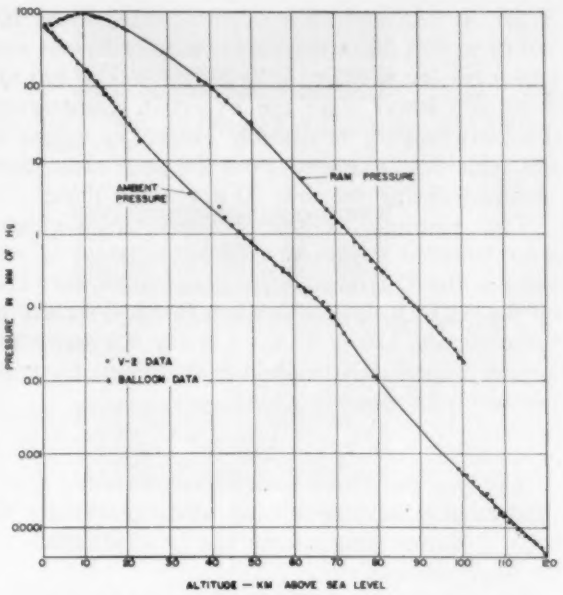


FIG. 17. Variation of pressure with altitude.

Temperature measurements are of two types: (1) measurement of ambient temperatures and (2) measurement of skin temperatures and temperatures within the missile. The direct measurement of ambient temperatures from a rocket has not yet been successfully accomplished. The temperature of the atmosphere was calculated from the slope of the pressure *vs.* altitude curve and from the ratio of ram to ambient pressures. Pitot tube theory was used to obtain Mach number from the ratio of ram pressure to ambient pressure. The velocity of the rocket divided by Mach number gave the velocity of sound, from which temperature was calculated. Figure 18 is a plot of the temperatures derived by these methods. Shown also are the temperatures measured by means of a weather balloon released within an hour of the time of the rocket's flight. For comparison, the NACA estimated mean temperature[37] is included on the curve. Probable error is ± 25° from 50 to 60 km, ± 15° at 65 to 70 km, and

[29] Whipple, Fred L., Meteors and the earth's upper atmosphere, *Rev. Mod. Phys.* **15**: 246–264, 1943.

[30] Gutenberg, B., The velocity of sound waves and the temperature in the stratosphere in Southern California, *Bull. Amer. Meteor. Soc.* **20**: 192, 1939.

[31] Strong, J., *Procedures in experimental physics,* 145, N. Y., Prentice-Hall, 1944.

[32] Yarwood, J., *High vacuum technique,* 29, London, Chapman and Hall, 1945.

[33] Strong, *op. cit.,* 143.

[34] Best, Nolan R., Eric Durand, Donald I. Gale, and Ralph J. Havens, Pressure and temperature measurements in the upper atmosphere, *Phys. Rev.* **70**: 985, 1946.

[35] Best, N., R. Havens, and H. LaGow, Pressure and temperature of the atmosphere to 120 km, *Phys. Rev.* **71**: 915, 1947.

[36] Taylor, G. I., and J. W. Maccoll, *Proc. Roy. Soc.* **139**: 278, 1922.

[37] Warfield, Calvin N., Tentative tables for the properties of the upper atmosphere, *Natl. Advisory Com. for Aeronautics, Technical Note* 1200, 1947.

$\pm 20°$ at 72.5 km. The probable error above 100 km is $\pm 40°$. Temperatures calculated from ram pressures for altitudes between 10 and 20 km are 5 to 20° lower than the expected temperature. This discrepancy is possibly caused by errors in the velocities calculated from the poor radar data obtained during the first 20 km of the flight.

Two platinum resistance temperature gauges were installed to measure the temperature of sections of the 15° nose cone. The temperature rise on the 0.1 inch thick aluminum forward section of the nose was $120 \pm 5°$ C. On the 0.1 inch steel section immediately behind the aluminum, the temperature rise was $85 \pm 5°$ C.

IONOSPHERE

It is now possible to extend further our knowledge of the ionosphere[38] by utilizing rockets to make measurements within the ionized region of the upper atmosphere.

The value of experimental methods utilizing rockets may be shown by a consideration of the parameters involved in the simple approximate expression for the index of refraction in an ionized medium, neglecting the earth's magnetic field.

$$(1) \qquad n = \sqrt{1 - \frac{4\pi N e^2}{w^2 m}}$$

n : Index of refraction
N: Ion density
e : Charge on the ion
m: Mass of ion
w: Angular frequency of radiation.

Radio pulse ionosphere height-finding methods in wide use today[39] can at most measure directly the index of refraction at certain points, whereas rocket-borne experiments may be designed to measure directly both the index of refraction and the ion density N at all points reached by the rocket. The V-2 reaches altitudes corresponding to the top of the E layer. Since in the E layer there is at present ambiguity as to the ratio of free electrons to ions, rocket-borne experiments are the most direct way to determine whether the parameter on the right hand side of the expression should be in terms of electrons, ions, or both. A determination of data such as these will permit more accurate knowledge of many of the factors affecting long distance radio propagation, such as delay times, velocities of propagation, phase shifts, intensities and numbers of modes, direction of arrival of wave fronts, ducting, multipath phenomena, and the actual rapidity of variations of these quantities.

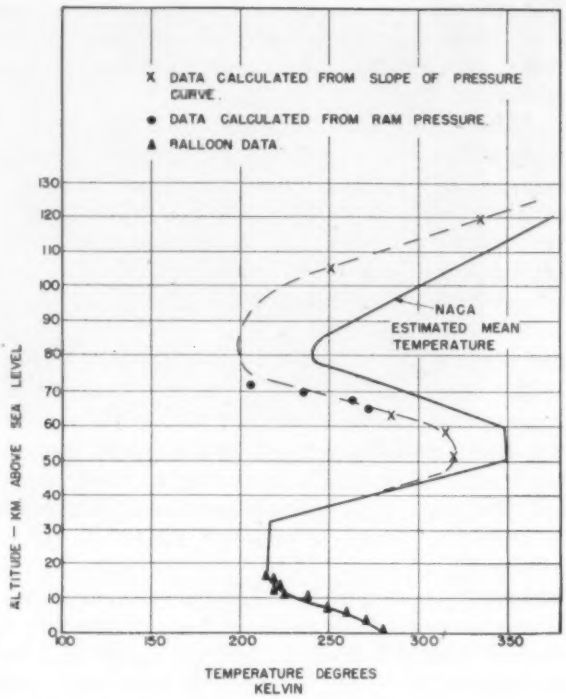


FIG. 18. Variation of temperature with altitude.

The method we are using for measuring the index of refraction consists of the transmission of two or more harmonically related crystal-controlled continuous wave radio frequency signals from the rocket to special receiving and recording equipment at suitable locations on the ground. These frequencies of transmission are so chosen that one is sufficiently high that its velocity of propagation is essentially unaffected by the ionosphere; that is, in the above equation, the index of refraction remains essentially unity. The other frequency is chosen to be slightly above the maximum critical frequency predicted for the regions which the rocket will penetrate. For the latter frequency, as may be seen from the equation, the index of refraction will approach zero, and as a result the velocity of propagation will be greatly affected. If one considers the phase relation between the two radio frequency signals as received on the ground, it may be shown, that for transmission from any point in the ionosphere, the rate of change of phase between the two signals as received on the ground is a function of the missile velocity and the index of refraction for the par-

[38] Mimno, H. R., *Rev. Mod. Phys.* **9**: 1, 1937.
[39] Fleming, *op. cit.*, ch. IX.

ticular frequency at that point.[40] This allows the determination of the index of refraction for the low frequency as a function of altitude, with a suitable choice of the higher frequency.

The phase beat frequency experiment has successfully recorded continuous data up to an altitude of approximately 110 km and at several points above that up to 128 km.[41] Although the analysis of these data is very complex and although only a preliminary analysis has been made, I would like to point out a few of the interesting results of this experiment. Figure 19 shows a series of curves of the received signal strength on the ground at one of the receiver stations versus the altitude of the missile. A similar set of curves was obtained at a second receiving station located about 30 miles from the first. The theoretical free-space signal strength at the receiver station should be a continuously decreasing function with altitude. The fluctuations in the curves are primarily due to ionospheric attenuation and the missile antenna patterns. The latter are being obtained from models, and the curves will be corrected accordingly. There is some reason to believe at this time that the sudden drop at 65 km is due to the presence of the *D* layer.

Figure 20 shows representative sections of the continuous film records obtained at one receiving

[40] Seddon, J. C., and J. W. Siry, Upper atmosphere research report no. I, chap. III, Theoretical discussions of the ionosphere experiment, *Naval Research Lab. Rept.* R-2955: 49, 1946.

[41] Burnight, T. R., J. F. Clark, and J. C. Seddon, Upper atmosphere research report no. IV, chap. VI, Ionosphere research with the V-2, *Naval Research Lab. Rept.* R-3171, 1947.

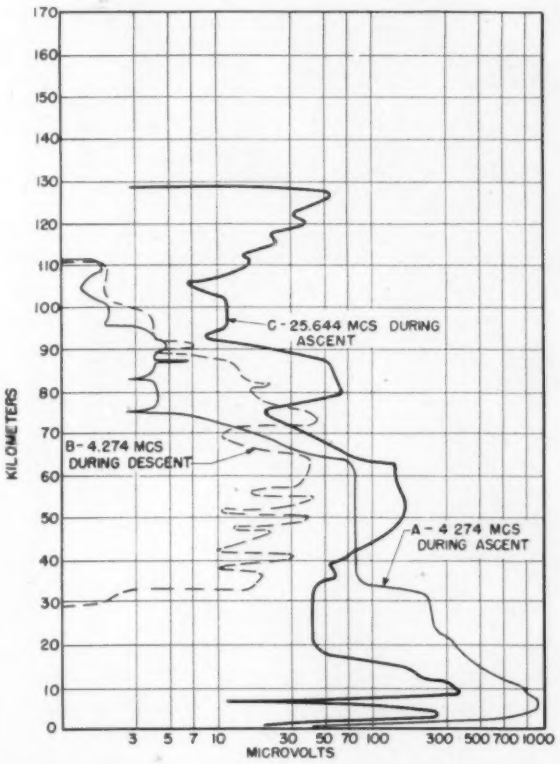
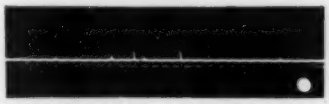
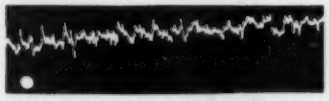


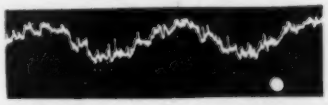
FIG. 19. Signal strength versus altitude as recorded at one of two ionosphere ground stations at White Sands, New Mexico, between 11:23 and 11:30 A.M. MST during the V-2 flight of 7 March 1947.



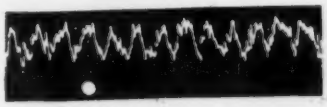
A. ALTITUDE 12 Km., 43 SECONDS AFTER TAKEOFF



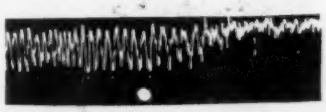
B. ALTITUDE 79 Km., 94 SECONDS AFTER TAKEOFF.



C. ALTITUDE 90 Km., 103 SECONDS AFTER TAKEOFF.



D. ALTITUDE 100 Km., 113 SECONDS AFTER TAKEOFF.



E. ALTITUDE 111 Km., 123 SECONDS AFTER TAKEOFF.

FIG. 20. Representative sections of the continuous film record showing beats of harmonically related frequencies. (*a*) Record obtained below the ionosphere (up to 43 km). (*b*) Slowly varying beat recorded at an altitude of 79 km. (*c*) Record at approximately 90 km showing a well defined wave form. (*d*) The beat above 100 km showing a more complex wave form. (*e*) The sudden cessation of the phase beat frequency at 111 km at which point the 4.274 mcs signal disappeared completely.

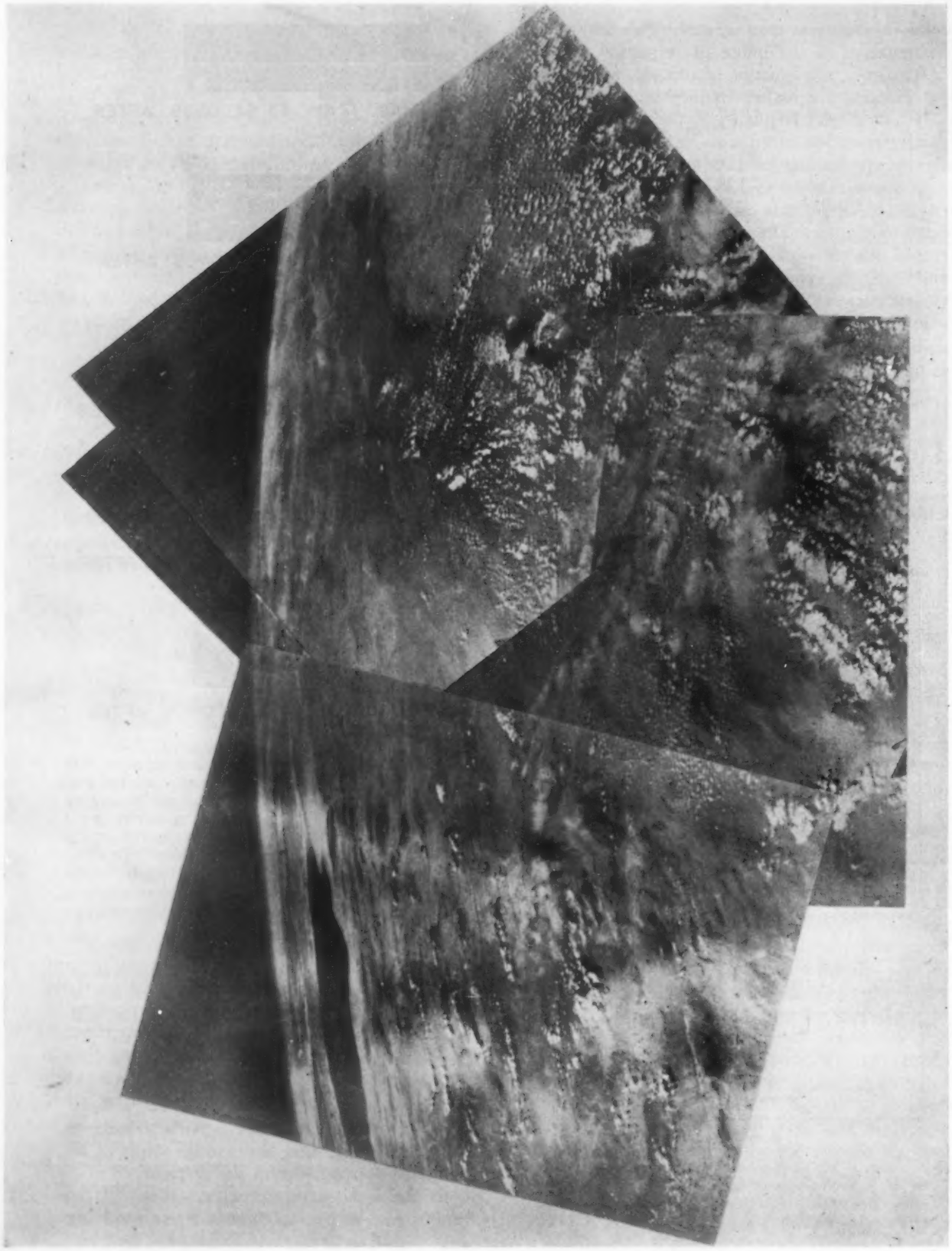


FIG. 21. A composite picture made up of three separate photographs taken at an altitude of 162 kilometers (101 miles). This picture covers approximately 500,000 square miles of southwestern United States and northern Mexico. The photographs do not match exactly owing to the varying camera angles.

station, and illustrates very clearly the different types of complex beats obtained. The phase beat frequency first became apparent at about 43 km altitude and remained at a low value up to about 84 km. This would imply that if a *D* layer exists in this region its effect on the 4.274 mc signal was small below 84 km. The phase beat frequency increased rapidly at 84 km. At 111 km the beat frequency is lost owing to loss of the 4.274 mc signal. Intensive analysis of the phase beat frequency data is continuing and it is hoped that a more definite report will be available in about six months.

Many experimental problems associated with the ionosphere work have been encountered and solved, and a great deal of invaluable experience as to a suitable instrumentation for rocket investigation has been acquired. It was soon found that the problem of developing suitable antennas for transmitting at low frequencies from the rocket was a major problem. Considerable theoretical and laboratory research has been carried out to establish a fundamental basis for the direct measurement of the electron and ion densities as a function of altitude. An experiment is virtually complete for inclusion in a July flight, which involves primarily a determination of the saturation current for electrons and positive ions.

MISCELLANEOUS

Cameras have been included in several flights and pictures obtained to altitudes of 160 km.[42] A composite of several such pictures is shown in figure 21. The Gulf of California and surrounding territory are clearly evident in the picture. Photographs of this type are very useful for meteorological cloud studies as well as for cartographic purposes.

On the night of December 17, 1946, the first night V-2 launching in this country was made for the purpose of conducting an experiment with artificial meteorites. This experiment, conducted jointly by the Applied Physics Laboratory, the California Institute of Technology, and Harvard University, consisted of dropping out special charges, at intervals of about 20,000 feet, above 60,000 feet. The charges were to explode one or two seconds after leaving the missile. High velocity particles should then appear as artificial meteors and as a matter of fact in a few cases some of the particles might have enough velocity to escape the earth. This experiment was unsuccessful because of ejection difficulties but will be repeated sometime this fall.

On various flights special strains of rye seeds, corn seeds and fruit flies have been taken to altitudes of 170 km to determine whether radiation above the atmosphere might produce mutations. The order of magnitude of cosmic radiation was, of course, known and because of its low intensity very little or no effect was anticipated. However other less energetic radiation might exist at these altitudes which could possibly produce an effect. Analysis made by Harvard on recovered seeds and flies has shown that no detectable changes are produced by the radiation. These results are not yet conclusive because in most cases the seeds were shielded by metal (in order to facilitate recovery) so that only the higher energy radiation would have been effective. If recovery methods are improved, containers having very thin walls will be used to study the effects of the lower energy radiation.

In general the various laboratories involved are approaching the above problems in different ways. Numerous other experiments are being planned for the future, of which a few might be mentioned. The Applied Physics Laboratory and the Watson Laboratories are both planning different types of experiments to measure the intensity of the earth's magnetic field at different points in space. Three very interesting experiments—one to measure temperature, a second to take samples of the atmosphere, and a third to measure wind direction and velocity at various altitudes are to be conducted by the Signal Corps in a July firing. The measurement of temperature is to be accomplished by measuring the velocity of the sound, generated by explosive charges detonated at various altitudes up to 60 km, between the rocket and the ground. Samples of the atmosphere are to be obtained at various altitudes up to 80 km by opening and sealing sample bottles at various altitudes. Wind velocities will be measured between the altitudes of 30 and 60 km by releasing smoke from a specially installed smoke generator after the rocket has reached approximately 30 km altitude. The smoke will then be tracked by optical instruments on the ground.

The next several years should see very interesting developments in the field of upper atmosphere research, now that the techniques and ground

[42] Bergstralh, T. A., Photography from the V-2 rocket at altitudes ranging up to 160 kilometers, *Naval Research Lab. Rept.* R-3083, 1947.

FIG. 21. A composite picture made up of three separate photographs taken at an altitude of 162 kilometers (101 miles). This picture covers approximately 500,000 square miles of southwestern United States and northern Mexico. The photographs do not match exactly owing to the varying camera angles.

work therefor have been laid. At the present rate of firings there is a sufficient number of V-2's on hand to last for another two years. Because of this, numerous long range experiments are planned which are more complex than any that have been performed so far. The rocket has opened the door to vast regions of space which at present are known to us primarily through the astronomer's telescope. When one considers the large amount of work that has been done by the astronomers and the greater understanding of the universe that this work has given us, one cannot help being impressed by the research potentialities of this new field.

ZEBULON MONTGOMERY PIKE AND THE WILKINSON-BURR CONSPIRACY

W. EUGENE HOLLON

Assistant Professor of American History, University of Oklahoma

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ZEBULON Montgomery Pike is well remembered today because of his discovery of the great peak in Colorado in 1806 which bears his name.[1] Few men can hope for a more imposing and lasting monument to their memory.

His association with and friendship for the infamous General James Wilkinson likewise has had much to do in keeping Pike's name alive. The General, on the other hand, is well remembered for his relations with Aaron Burr. The latter, like Benedict Arnold, needs no introduction. These two men rank as America's foremost traitors, with General Wilkinson a close third. By a strange fate all three served creditably with General Gates at Saratoga in 1777, the battle which proved to be the turning point of the American Revolution. Pike is not to be judged or compared with these three, yet his relationship with Wilkinson has caused much speculation and warrants close examination.

Events of the past must be evaluated within the frame of contemporary conditions. The story of Zebulon Montgomery Pike's expedition through the Southwest is generally known and it is not necessary to review it in detail. But interesting questions have been posed during the many decades since 1806–1807, which justify our restating them in order to study their validity.

Pike was born on January 5, 1779 at Lamington, Somerset County, New Jersey.[2] He entered the army in 1794 and served under General Anthony Wayne in the Battle of Fallen Timbers the following year. His two expeditions to the West in 1805 and 1806 contributed much knowledge of the newly purchased Louisiana Territory. His journal of the expeditions was published in 1810 and constitutes the principal source of information about him,[3] along with several dozen personal letters, public documents, and numerous newspaper and magazine articles still in existence. He was killed in 1813 while leading the attack against York, now Toronto, in the War of 1812.

The printed and manuscript materials in regard to Wilkinson and Burr are very numerous, yet considerable mystery still remains about both. The incriminating evidence against James Wilkinson convicts him, without question, as a traitor to his country. But if Pike is to be condemned as a willing tool of the nefarious General and a cog in the Burr conspiracy, it must be done largely by circumstantial evidence. His close association with Wilkinson was accidentally brought about by the purchase of Louisiana in 1803. It seems probable that they knew each other before then, since both were professional army men at a time when our military forces numbered scarcely more than 3,000 troops.[4]

Jefferson had been interested in the vast unknown region of Louisiana many years before any thought was given to buying the territory. In 1785 he talked with John Ledyard[5] in regard to plans whereby the latter would cross Siberia to Kamchatka, then sail across the Pacific and finally make an overland journey through the Louisiana territory. But Ledyard was turned back by Russian officials. Five years later Captain John Arm-

[1] The peak was named James Peak in 1822 after Dr. James Long, who was the first to reach its summit. But trappers and traders, who came into the Colorado area later, insisted upon calling it Pike's Peak. It is not known when the change in name became official, but it was sometime after the gold rush in 1859.

[2] Considerable confusion exists as to Pike's exact birthplace. Almost all historians declare that the General was born in Lamberton, now in the southern part of the City of Trenton, New Jersey. William J. Backes, an eminent Trenton historian, states that Pike was a native of Somerset County and not Mercer County. At the time of his birth the town in which he was born was called Allamatunk. Backes has proved that Allamatunk is Lamberton, Somerset County and not Lamberton, Mercer County. Since 1836 Lamberton, Somerset County has been called Lamington. See the *Somerset Co. Hist. Quart.* **8** (4) : 251, Somerville, N. J., 1919

[3] The best annotated edition of Pike's journal is that edited by Dr. Elliott Coues, *The Expeditions of Zebulon Montgomery Pike,* 3 v., New York, 1895.

[4] *American State Papers, Miscellaneous,* I, 548.

[5] John Ledyard (1751–1789) as a corporal in the United States Marines accompanied Cook on his last voyage (1776–1779) and later wrote a *Journal of Captain Cook's Last Voyage to the Pacific Ocean* (1783). *Webster's Biographical Dictionary,* 875, 1st. ed., Springfield, Mass., 1943.

strong made an attempt to explore the region, starting from the eastern part of the United States, but was stopped by the Indians. In 1792 The American Philosophical Society, upon the recommendation of Jefferson, backed André Michaux, the French botanist, in an expedition to the West. Michaux got involved in the Genêt intrigue and did not travel beyond the Mississippi.[6]

When Jefferson became President in 1801, army men believed that further plans for the exploration of the territory would be inaugurated. Immediately after the purchase of Louisiana he asked Congress for permission to organize an expedition for the exploration of the region west of the Mississippi. The result of such action was the well-known Lewis-Clark Expedition, 1804–1805. Much scientific information was subsequently obtained concerning the West, and the journal published in 1813 by the two explorers gave the East its first accurate knowledge of the Far West.

Other government-sponsored journeys to the country west of the Mississippi were soon inaugurated; the most important were the two under the leadership of Lieutenant Zebulon Montgomery Pike, who in 1805 was attached to the First Infantry Regiment stationed at Kaskasia, Illinois. The Mississippi and Arkansas expeditions, as they were called, were not authorized directly by Jefferson, as in the case of the one by Lewis and Clark. General James Wilkinson, Military Governor of Upper Louisiana with headquarters at St. Louis, ordered Pike in 1805 to ascend the Mississippi River to its source. The President was informed of the expedition after it was under way, and gave his approval. Why Pike was chosen to lead this party is not known, other than the fact that he was available, young and vigorous, and extremely anxious to obtain fame and promotion.

He left St. Louis before Lewis and Clark returned from the Far West. The purpose of his Mississippi journey was primarily to offset the Spanish, French, and English influence among the various Indian tribes, and to collect information about the number, character, and power of the natives in the northern part of the Louisiana region. Scientific information was desired, but not stressed as much as in the case of Lewis and Clark. It was important that Pike ascertain the geographical boundaries of Upper Louisiana, acquire some knowledge of its soil and natural production, and determine the courses of the rivers and their fitness for navigation.

Nineteen men accompanied Pike from St. Louis on August 9, 1805. Eight months and twenty days later, after many hardships, they returned to Wilkinson's headquarters. Important results were obtained by the party, although the actual source of the Mississippi had not been reached. Pike's experience was extremely useful for he was to make a more extended tour of the Southwest a few months later.

Wilkinson was well pleased with his young protégé. The basis of a friendship was thus founded which lasted as long as Pike lived, but caused him considerable embarrassment. Doubtless one of the reasons Wilkinson selected this particular officer to lead the northern expedition was to test him for a greater task. On December 30, 1805, he wrote to the Secretary of War:

> I have the honor to enclose to you a copy of Lt. Pike's last communication to me of which I mentioned in my last. I indulge hopes of seeing him in the course of the month. He appears too ardent, yet may not, I hope lack prudence.[7]

Within two months after reaching St. Louis, the young officer was selected for a second perilous mission, an exploratory journey up the Arkansas River to its source and then to the Red River, from whence he was to return to Lower Louisiana. This latter expedition is by far the most important of the two, since its real motive has caused so much speculation by historians. Furthermore, it cast a shadow of suspicion over Lieutenant Pike which has never been completely removed. That Wilkinson had ulterior motives in sending his subordinate into Spanish territory can hardly be doubted in view of the evidence that remains. It seems certain, moreover, that the expedition as originally planned in some way fitted into the sinister motives, whatever they were, that Burr and Wilkinson fostered relative to the Southwest.[8] To what extent Pike knew the real purpose of his southwestern tour into Spanish territory and the

[6] Riegel, Robert E., *America Moves West*, 99–100, N. Y., Holt, 1930.

[7] General James Wilkinson to Secretary of War Henry Dearborn, St.Louis, December 30, 1805, Records of the Adjutant General's Office, National Archives, Washington, D. C. Hereinafter referred to as Nat. Arch., R. A. G. O.

[8] See Jacobs, James P., *Tarnished Warrior*, N. Y., Macmillan, 1938, Shreve, R. O., *The Finished Scoundrel*, Indianapolis, Bobbs-Merrill, 1933, and McCaleb, Walter F., *The Aaron Burr Conspiracy*, 2nd ed., N. Y., Wilson-Erickson, 1936, for rather complete accounts of the Wilkinson-Burr affair.

part which he was supposed to play may never be known.

A brief examination of Burr's activities at this point is necessary in order to see how he fits into the scheme. He was one of the most brilliant men ever to enter public life in the United States. Even before his duel with Hamilton in 1804 he had shown a personal interest in the West. The region west of the Appalachian Mountains had traditionally looked with suspicion upon the aristocratic East and had long been ready to seek its own advantage without the rest of the country. With Spain as its neighbor, and in control of the mouth of the Mississippi, there had been much talk since 1783 of a separate western nation, one that would either join Spain or ally itself with her.

As the Vice President's interest in the West increased, it was natural that he would find common cause with James Wilkinson. Few surpassed Burr in knowledge of politics in the East, and no one equaled Wilkinson's information about the Southwest. The two men had known each other since the Revolution, and although they had met and corresponded during the intervening years, they had never been jointly concerned in any great enterprise. During 1799 Wilkinson had visited with Burr in New York, and in 1800 Burr helped place the General's sons in Princeton. When Wilkinson was enroute to Washington in May, 1804 he sent Burr the following message:

> To save time of which I need much and have little, I propose to take a bed with you this night, if it may be done without observation or intrusion. . . . Answer me and if in the affirmative I will be with you at 30 after the 8th hour.[9]

In the knowledge of subsequent events, each seems to have obtained help from the other in formulating a plan for their mutual advantage. Burr was still influential (the duel with Hamilton had not yet taken place), and later lent his support to the appointment of Wilkinson as Military Governor of Upper Louisiana. What the two men talked about in May, 1804 is not known, but it appears likely that the chief topic of conversation was the West, Spanish Florida, and Mexico.[10]

Soon after his term as Vice President expired, Burr prepared to depart for the West via the Ohio and Mississippi Rivers. He had previously suggested to the English minister, Anthony Merry, whose country had been anxious to weaken the United States, that he could induce the states west of the Appalachian Mountains to withdraw from the Union if $500,000 were placed at his disposal and a British fleet of warships stood by the mouth of the Mississippi to help promote his designs. Merry sent word to London for advice, as Burr left on his tour of inspection. Wilkinson was to meet him at Philadelphia in May, 1805, but arrived after Burr had already departed. The General finally overtook Burr at Fort Massac, where the two men spent four days in secret conference.

The newly-appointed Military Governor then journeyed on to his station in St. Louis, while Burr left for New Orleans. The latter reached that city in June, 1805, a few days before Pike departed on his Mississippi tour. Thanks to letters of introduction from Wilkinson, Burr was cordially received by the more prominent people of New Orleans. However, within a few weeks rumors began to circulate that a plot to separate the West from the United States and a conquest of Mexico were contemplated. One of Wilkinson's friends at New Orleans wrote him of the rumors and whispers that linked his name with that of Burr's. He stated,

> . . . You are spoken of as his right hand man. . . . The tale is a horrid one. . . . Kentucky, Tennessee, the State of Ohio, with part of Georgia and Carolina, are to be bribed with plunder of the Spanish countries west of us to separate from the Union.[11]

The news undoubtedly disturbed Wilkinson, who realized that the President would be stunned at hearing such talk. A few days before Wilkinson received the letter, Burr arrived at St. Louis for a short visit before returning to the East. He was enthusiastic over prospects that the West was ready to revolt, but Wilkinson was careful to say very little, while obtaining as much information from Burr as possible. The former Vice President returned to Washington shortly afterwards to learn that the British had not replied to his proposal. He then approached the Spanish minister, Yrujo, with plans for destroying the Union and promoting the interests of Spain, but the government of Charles IV was likewise slow in responding.

Burr then tried raising money from private sources. He succeeded in borrowing approximately $50,000 and in July, 1806 wrote Wilkinson a letter in code to the effect that he was leaving

[9] Jacobs, *The Tarnished Warrior*, 211.
[10] *Ibid.*, 212.
[11] McCaleb, *The Aaron Burr Conspiracy*, 32–33.

for the West in August and that money was available, river boats were being built, and he expected to have from five hundred to one thousand men at the Falls of the Ohio by the middle of November. The letter also stated that he probably would reach Natchez by late December, where plans for seizing Baton Rouge might be made. The General could expect high rewards for his cooperation.[12]

Whether Wilkinson at this time was acting in conjunction with the supposed plans of Burr against Mexico, or whether his motives and reasons were such as the Commander of the United States Army might properly entertain, is difficult to determine. Relations between Spain and the United States were strained and talk of war had been prevalent for two or three years. While Pike was away on his Mississippi tour, Wilkinson had written to the Secretary of War in regard to possible war with Spain:

> If any thing should be done from this quarter direct, and I might be indulged to recommend my officers to plan and lead the expedition, if I do not reduce New Mexico, at least, in one campaign, I will forfeit my command.[13]

A short time later Senator Adair of Kentucky, who was a close friend of General Wilkinson, wrote, "Pray, how far is it, and what kind of a way from St. Louis to Santa Fe, and from there to Mexico?" To which Wilkinson replied, "Do you know that I have reserved these places for my own triumphal entry, that I not only know the way but all the difficulties and how to surmount them? I wish we could get leave, Mexico would soon be ours."[14]

The purchase of Louisiana in 1803 solved many of the problems of the West and it soon became apparent that the people of this region were becoming less inclined to separate from the Union. Wilkinson was in a position at St. Louis to observe the change of attitude and it was very possible that he now decided to abandon this part of his previous plan. Burr was finding it difficult to obtain aid on as large a scale as he had contemplated; Spain and England were not interested in his venture. But Mexico alone offered many possibilities for conquest, glory, and riches, whether the United States went to war with Spain or not.

One of the best known researchers in the field of Southwest history is Dr. I. J. Cox.[15] He concludes that Wilkinson's correspondence, combined with his previously known relationship with the famous Philip Nolan, seems sufficiently definite to justify the assertion that Pike's expeditions, both of which were undertaken without express orders from the President, formed a part of the General's own private scheme. If this assertion is true, it is therefore not illogical to assume that Pike's southwestern expedition, ordered by Wilkinson in June, 1806, was designated to obtain information for the use of Burr and Wilkinson in their invasion of Mexico. As long as the War Department was indicating a passing interest in an armed invasion of New Mexico, it would be easy for Wilkinson to pretend that the expedition up the Arkansas was in the interest of his government.

In June, 1806, Wilkinson received notice from the War Department to transfer his headquarters to Lower Louisiana.[16] Before leaving St. Louis he sent additional instructions to Pike and ordered him to depart for the Southwest at once.[17] He then turned his attention to Burr with the realization that, if their previous plan failed, serious consequences would result. Immediate action had to be taken or Wilkinson could expect a summons to Washington to answer charges which linked his name with the many rumors concerning Burr's activities.

Before following the General's next moves, an examination of Pike's southwestern expedition is necessary. Many historians have long believed that Pike was sent into Spanish territory in order to be captured by the Spaniards and taken into the interior of Mexico, thus being afforded the opportunity of observing their military preparedness. They further maintain that the American officer knew the role he was to play, at least to a degree. There is some evidence that Pike knew more about the real motives of the expedition than he pretended. A letter from Wilkinson on August 6, 1806 read in part,

[12] Aaron Burr to Wilkinson, July 29, 1806. The full text of the cipher letter has been published in A. J. Beveridge's *The Life of John Marshall* III, 614–615, N. Y., Houghton Mifflin, 1916–1919.

[13] Wilkinson to Dearborn, November 26, 1805, Nat. Arch., R. A. G. O.

[14] McCaleb, *Aaron Burr Conspiracy*, 111–112.

[15] Cox, I. J., *Early Explorers of Louisiana, University Studies* II (1): 105–116, Univ. of Cincinnati, 1906.

[16] Jacobs, *Tarnished Warrior*, 229. Although the War Department was adopting a conciliatory attitude towards Spain, it felt that the presence of American troops near the Sabine River might well serve as a matter of precaution. Then too, Wilkinson was making many enemies in the region of St. Louis and Jefferson believed that his transfer was imperative.

[17] Cox, *Early Explorers of Louisiana*, 112.

> Be circumspect and discreet, while in the vicinity of Spanish settlement, as you will be held responsible for consequences . . . to me you may and must write full and freely, not only giving minute details of everything past, worthy of note, but also of your prospects and conduct of the Indians. If you discover that any tricks have been played from St. Louis, you will give to me with names, to warn him against improper confidence and deception. . . . Should fortune favor you on your present excursion, your importance to our country will, I think, make your future life comfortable.[18]

Did Wilkinson now realize that Burr's scheme was doomed to complete failure and that it was time for him to salvage his own reputation? If so, the above instructions might be implied as a warning to Pike not to involve him by any rash actions that might create a border incident. The "tricks played from St. Louis" would further indicate that Wilkinson had reason to suspect spies of watching Pike's expedition. [The Spaniards knew of the intended expedition before it departed from St. Louis.] It is significant that Wilkinson also instructed his subordinate, in his letter of August 6, to report to him in detail but not to the Secretary of War.

It may well have been that General Wilkinson had a personal motive in authorizing the expedition into the Southwest, and that in some way this motive was, or had originally been, connected with Aaron Burr. If so, did Pike believe that Wilkinson was serving the best interest of his country, or his own personal interest? Some of the explorer's critics accused him of outright treason; others declared him "highly unethical and untruthful."[19] But Pike's defenders pointed out that, if the southwestern adventure was for the purpose of spying out the land for Aaron Burr, then Pike would certainly have never been chosen for the mission. They argued that many other men with a knowledge of New Mexico and the Spanish language were available, and that one going in the guise of a trader would have attracted nothing like the attention and suspicion of a troop of armed horsemen. "More than that," says one authority,

> if Wilkinson and Burr had seriously wanted a reconnaissance of New Mexico, they would have wanted it in 1805—not 1806 or 1807. A serious reconnaissance of New Mexico required an accurate military strategist. . . . Only an expert, supplied with the best instruments and the best methods of transporting them, could have fixed altitude, latitude, and longitude correctly.[20]

There is much logic in this reasoning, but it is not conclusive.

Accompanying the Pike party of twenty-two officers and men from St. Louis in July, 1806 were fifty-one Osage Indians. They lived on the Missouri River at the town of Grand Osage, and Pike was instructed to escort them home.[21] Also with the party was a mysterious individual, Doctor John Robinson, who, with Wilkinson's permission, had attached himself to the expedition. Robinson's destination was Santa Fe, where he supposedly hoped to collect a debt for one of Wilkinson's close friends, William Morrison, a well-known merchant of Kaskaskia, Illinois. Morrison had intrusted some wares to a Baptiste La Lande several years previously. La Lande had settled in Santa Fe and apparently had no intention of returning to Kaskaskia.

The party reached the Osage settlement about the middle of August. After a rest of a few days the Americans left the Missouri, ascended the Osage to its source, and then headed west by land for the Arkansas. They reached that river on the eighteenth of October at a point where the water was very shallow and bed of the stream not more than twenty feet wide. Here eight members of the group under Lieutenant Wilkinson, a son of the General, detached themselves according to instructions and descended the Arkansas in makeshift canoes to the military post on its lower waters. The main body of the party continued westward, supposedly in search of the Red River, which they intended to descend to its confluence with the Mississippi.[22] Pike and his men suffered innumerable hardships. They wandered far into the present state of Colorado, where winter overtook them.

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[18] Coues, *The Expeditions of Zebulon Montgomery Pike* II, 575.

[19] Crichton, Kyle S., Zeb Pike, *Scribner's Magazine* **82**: 462–467, 1927. Crichton goes further in condemning Pike of treason than any other writer; however he fails in his arguments to include much of the evidence in Pike's defense.

[20] Hart, Stephen Harding, and Archer Butler Hulbert (eds.), *Zebulon Pike's Arkansaw Journal*, lxxii–lxxiii, Denver, Stewart Commission of Colo. College and Denver Pub. Lib.

[21] Escorting small bands of Indians back to their tribal headquarters was a common practice by the army at the time. General Wilkinson's written instructions to Pike on June 24, 1806 listed this as the primary object of the southwestern expedition.

[22] The alleged fact that Pike expected to reach the military post at Natchitoches at approximately the same time that Lt. Wilkinson did, weakens the charge that he expected to be captured by the Spaniards.

Inadequate clothing and equipment added greatly to their suffering, but none died from exposure and hunger.

Near the end of November the small band of soldiers reached the foot of the great peak which today bears the name of their leader. The party did not ascend the peak, since the task would have been impossible under existing conditions. After a few days of wandering in the wilderness of the mountains, they turned south in hopes of eventually reaching the Red River. At length a stream was discovered which Pike pretended to believe was that river. After traveling southward along its bank for several days, the party halted and constructed a rude shelter, or fort. Some of the men had been left behind because they were unable to walk, their horses having long since died, but volunteers were sent back for them after a few days of rest.

A glance at the map shows that Pike could not have previously crossed the Red, since its source lies south of the route he pursued westward from his point of departure on the Arkansas. This factor is very much in the officer's favor, in that his critics have maintained that he must have known he was on the Rio Grande while pretending to believe that he was on the Red. Regardless of which stream it was, it should have been obvious to Pike that he was in Spanish territory when he constructed his fort five miles west of the river.[23]

The location of the camp has been the most difficult for Pike's champions to explain satisfactorily. But Professors Hart and Hulbert again come to his defense. They point out that his maps show that he marked the Rio Grande as "Red River," and never had an opportunity to correct the mistake before they were taken from him by the Spaniards. "If it was the Rio Grande," they continue, "our claim extended to it, including the right of navigation. And surely the fiercest Spanish partisan would not have gainsaid the party's right, under international law, to save their lives by going where firewood could be secured. If it was the Red River, as Pike's recovered maps still prove he thought it was, the American claim was as good on one side as the other."[24]

After constructing a shelter at Ojo Caliente, Pike dispatched five men back into the mountains after those left behind. On the same day he transferred to Dr. Robinson the claims for Morrison against La Lande in Santa Fe, and the Doctor departed for that settlement. Here again the opponents of Pike have been furnished with ammunition. They are of the opinion that Dr. Robinson's real purpose in going to Santa Fe was unpretentiously to inform the Spaniards of Pike's whereabouts, knowing that he would be captured and probably taken into the interior of Mexico for questioning.

Several days after Dr. Robinson's departure, Pike was intercepted a few miles above his camp, while hunting, by a Spanish dragoon and an Indian from Santa Fe. They informed him that the Doctor had reached that settlement and had been kindly received by the Governor. They likewise asked where his camp was, to which Pike escorted them. It was learned that Santa Fe was only two days' journey from the place and that a second visit by the Spaniards would be forthcoming.[25]

A further examination of the Wilkinson-Pike correspondence is herein necessary. Presumably Pike was not to go near Santa Fe, but on June 24, 1806 Wilkinson had written him,

> As your interview with the Comanches will probably lead you to the head branches of the Arkansaw and Red Rivers, you may find yourself approximated to the settlement of New Mexico. There it will be necessary you should move with great circumspection, ...[26]

Pike replied,

> . . . I shall use every precaution previous to trusting them [Comanches]; but as to the mode of conduct to be preserved towards the Spaniards, I feel more at a loss, as my instructions lead me into the country of the Tetuas [Comanches] part of which is no doubt claimed by Spain, in consequence of which, should I encounter a party from the village of Santa Fe, I have thought it would be a good policy to give them to understand that we were about to join our troops near Natchitoches, but have been uncertain about the headwaters of the river over which we passed [did he mean the Red?] but, that now, if the commandant approved of it, we would pay him a visit of politeness. . . . But if Spanish jealousy, and the instigation of domestic traitors should induce them to make us prisoners of war (in time of peace), I trust to the magnanimity of our country for our liberation.[27]

[23] At Ojo Caliente near the present border of Colorado and New Mexico.

[24] Hart and Hulbert, *Zebulon Pike's Arkansaw Journal*, xcii.

[25] Sparks, Jared, Zebulon Montgomery Pike, *The Library of American Biography*, 270–274, Boston, 1845.

[26] Coues, *The Expeditions of Zebulon Montgomery Pike* II, 563.

[27] *Ibid.*, 570–571.

Kyle S. Crichton, who is highly critical of Pike, points out that the composition of such a letter—by a loyal officer of the United States Army—in the face of denials then and later that he had any idea of getting near Santa Fe, was a rather curious transaction. Was Pike supposed to read between the lines in Wilkinson's instructions to him of August 6?

On October 2, 1806, Pike made this observation in a communication to his commanding officer:

> Any number of men who may reasonably be calculated on would find no difficulty in marching by the route we came, with baggage wagons, field artillery, and all the usual appendages of a small army; and if all the route to Santa Fe should be of the same description, in case of war I would pledge my life and what is infinitely dearer, my honor, for the successful march of a reasonable body of troops into the province of New Mexico.

Such a statement appears to be a strong indication that the purposes of the southwestern expedition were more than what Wilkinson enumerated in his various letters of instruction to his subordinate.

A few days after Pike was first overtaken by the Spaniard and Indian he received a second visit, this time by a party of fifty dragoons. He was informed that the Governor at Santa Fe had instructed them to escort him there, since he was trespassing on Spanish territory. He willingly submitted to "capture," and here again his critics have claimed that he was acting according to a preconceived plan, namely to allow himself to be taken prisoner by the Spaniards in order to spy upon them. But it seems obvious that Pike and his ragged band of half-starved soldiers were in no position to ward off fifty well-armed cavalry. His submission was the only logical action under the circumstances.

As soon as he arrived at Santa Fe and was presented to the Governor, he was subjected to a series of questions. At first he denied that Dr. Robinson was or had been a member of his party, but later changed his story. This act has often been cited as one of the clues to Pike's motives. His explanation for his conduct in this respect was later expressed in a letter to Governor Juaquin Alencaster. "On my being informed of his embarrassment," he said, "I conceived it would be adding to them to acknowledge his having accompanied a military party to the frontiers of the province, and conceived myself bound in honor and friendship to conceal it; but his scorning any longer the disguise he assumed has left me at liberty to make this acknowledgment of your Excellency, which I hope will sufficiently exculpate me in the opinion of every man of honor, and of the world, for having denied a fact which I conceived the safety of a friend in a foreign country, was concerned in the event."[28]

It is not necessary to trace in detail Pike's experiences for the next few months as a prisoner of the Spaniards except to state that he and his men were taken to Chihuahua and questioned by a Spanish official there, Governor Nemesio Salcedo. Pike was subsequently released and escorted to San Antonio, whence he made his way to Natchitoches. The other members of his party did not return from Mexico until the next year. All of the Americans apparently were treated kindly by the Spaniards. Salcedo did not believe their story about being lost, although he allowed them to return to the United States and even advanced Pike a loan of $1,000 to secure food and supplies for himself and his men.

The Spanish Chargé d'Affaires at Washington, Valentin de Foronda, later addressed a communication to Secretary of State Madison in which he made this significant comment relative to Pike's arrest: "According to the law of nations Dr. Robinson and the officer Pike should have been treated as spies: They were apprehended in a country concerning which there was not the least dispute, the least doubt, but that it belonged to my August Sovereign. It is true that the officer alleged that he lost his way. The statement may be true, but it may also be a pretext, and the latter is more probable. You know that if such excuses are satisfactory a spy could never be condemned."[29]

In later communications to Madison, Foronda charged the American government with the responsibility for Pike's actions, thus placing the administration in an awkward position either of repudiating Wilkinson or of assuming claims for damages, which the Spanish government placed at approximately $22,000.[30] Wilkinson was not

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[28] *Ibid.*, 810.

[29] Valentin de Foronda to James Madison, August 22, 1807, *Spanish Notes* II, Bureau of Indexes and Archives, Manuscript Division, Library of Congress, Washington, D. C.

[30] The Spanish government charged the United States for the cost of eight separate expeditions which they claimed were sent in search of Pike. This amount was more than twice the appropriations by Congress for all of the western expeditions to that date. The Spanish claims were not settled until the purchase of Florida in 1819 by the United States.

censured by the Administration for his actions, nor were the claims paid, owing to the extreme demands made by the Spaniards.

Pike's return to Natchitoches on July 1, 1807 excited little attention. The *National Intelligencer* of August 29, 1807[31] carried this brief comment: "Captain Pike, who has been detained in the interior provinces of Spanish America, arrived at this place [Natchitoches] in the evening of 30th last month." His friends and family were overjoyed to learn of his safe return. Much had happened since he had been away, especially to his good friend and promoter, General Wilkinson, who at this time was a star witness at the Burr conspiracy trial in Richmond, Virginia.

One of the principal matters that has kept the legend of Pike's treachery alive for more than a century has been the mystery which surrounds his lost papers. When he was captured by the Spaniards in New Mexico in 1806, he was relieved of his personal documents. These twenty-one papers were not returned to him when he was released, and Spanish diplomatic correspondence for several years insinuated that they proved his duplicity beyond question. Many individuals long felt that their contents would furnish the missing link to the whole Wilkinson-Burr-Pike episode. Pike tried unsuccessfully to obtain their return and he also asked General Wilkinson to use his influence in securing the confiscated documents. But the General did not appear too anxious for the papers to fall into the hands of his government, since he was not sure of their content.

The Pike papers remained in Mexico for over a century and all efforts to locate them failed until 1907, at which time Professor H. E. Bolton discovered them in the Mexican Archives. The State Department at Washington secured their return in 1910.[32] But unfortunately, they revealed little that was not already known. Of the twenty-one missing documents, only nineteen were recovered. The two that are still lost are believed by some to condemn Pike. But it seems incredible that anyone would have carried evidence on his person, assuming that he wished to be captured, that would have convicted him of treason to his government.

[31] The *National Intelligencer*, Washington, D. C., July 1, 1807. The complete files of this newspaper are now preserved in the Library of Congress newspaper collection.

[32] Papers of Zebulon Montgomery Pike, *Amer. Hist. Rev.*, 13 (4): 798–827, 1908. A more complete account of the search for and return of Pike papers appears in the September, 1947, issue of the *Mississippi Valley Historical Journal*.

During the year that Pike was absent on his tour of the Southwest, Wilkinson had evidently decided that Burr's grand scheme would not work and that he must act quickly in order to salvage his own reputation. Consequently, he informed the Administration that a plot to dismember the Union was under way and that he had sufficient evidence against Burr to prove his intended treason. He then declared martial law in the Louisiana region and made a great show of meeting the supposed invasion by Spanish forces in conjunction with Burr's arrival via the Mississippi River. Burr was ordered arrested and taken to Richmond, where Wilkinson appeared as a witness against him. The trial tended to blacken Wilkinson's reputation as much as it did Burr's, although many of the newspapers in the East hailed the General as a hero and patriot.

The motives of the Pike expedition made a subject for discussion at Richmond. One of the most damaging pieces of evidence against General Wilkinson was found in an affidavit of Judge Timothy Kibby of the district of St. Charles in Upper Louisiana, sworn by him on July 6, 1807. This affidavit went the rounds of the newspapers and was several times mentioned at Burr's trial. Two statements in the document are very important in relation to Pike's southwestern expedition. They read:

> . . . I asked the Genl. if Mr. Pike was sent by the Government of the United States. he replied no that that it was his own (the Genl.) plan and if Mr. Pike suckseeded he the Genl. would be placed out of reach of his enemies and that in the course of eighteen months he would be in a situation (if the plan suckseeded) to call his Damnd foes to an a/c [account] for their Deeds. I asked the Genl. if he did not apprehend danger from the Spaniards, knowing their jealouis disposition, on Mr. Pikes account with a party of American soldiers at Santa fee. he answered that Mr. Pike and his party would have documents to shew which would make them as safe as in Philadelphia.[33]

An examination of several American newspapers for the years 1806 and 1807 shows that the Burr trial was one of the most sensational stories in the history of American journalism. For months it crowded almost everything else from the news pages. The publications in the West, where

[33] The full text of the affidavit and a summary of the reasons given for suspecting Pike and Wilkinson of duplicity in connection with the Burr conspiracy are given in Papers of Zebulon Montgomery Pike, 1806–1807, *loc. cit.*

General Wilkinson was well known, did not hesitate to call him a traitor, liar, and scoundrel.[34] It is therefore natural that Pike's known friendship with a man of such reputation would cause him much embarrassment. Consequently, he did not escape criticism and censure.

In 1809 General Wilkinson appointed Major Pike as Acting Military Agent of the New Orleans territory. The General's critics in this area were now more convinced than ever that Pike was his accomplice. They harassed the young officer with charges of treason and duplicity, even going so far as to refer to him as "the beast of Santa Fe." It is difficult to evaluate these charges brought against Pike, since they often consisted of anonymous letters published in the local newspapers. But they do reflect in part public opinion. The Natchez *Weekly Chronicle* of July 27, 1809, charged:

> . . . A stricking coincidence of opinion prevails among all parties in the United States relative to Wilkinson. Here where his atrocities were first ushered into light, and where the effects of them are still palpable and present, there are some who were concerned with—and others who were his dupes, who pretend not to credit the charges which have been exhibited against him. It can only be a pretense—a person might as well deny the light of the sun, as to deny the truths which are well known.

A few weeks later[35] this comment appeared in the same paper:

> An old and respectable officer [Major MacRea] has the command of New Orleans Territory wrested from him, to give it to a soldier of yesterday; *a parasite of Wilkinson;*[36] the identical man who when a lieutenant assisted in bullying and beating the editor of the *Reading Eagle* (Pennsylvania) because he had the impudence to deny the infallibility of John Adams and who, as the public well knows, has lately exerted himself much in the names of authors who have endeavoured to expose the perfidy of Johnathan Wilk of the Burr conspiracy.—This is the first time we have ever heard of the rank of a senior officer being unequal to that of a junior officer.

But Pike did not hesitate to defend his tarnished friend in every way possible and in 1813 he wrote that in his opinion Wilkinson was the only person qualified for the office of secretary of war.[37] His personal correspondence at this period reveals much praise and many excuses for a man who is today considered one of America's greatest scoundrels and traitors. The Natchez *Weekly Chronicle* of March 5, 1810, summed up Pike's actions with this statement: "Those who advocate Wilkinson either know nothing of the man or are his minors."

The most damaging charge made against the explorer appeared in the New Orleans *Gazette,* November, 1809. It states:

> I have seen a communication in the *Courier* announcing the return of Captain D. Hughs, with the prisoners left by Major Pike in the Spanish provinces in the year 1807, with the exception of a Serjeant Meet [Meek], who was detained for having killed one of the party, who declared the purpose of Major's Pike's journey was different from the one announced. I would like to know Messrs Printers of every man who suspects the object of the expedition not to be laudible or patriotic, is to be murdered? Is General Wilkinson and his myrmodors [*sic*] reduced to the alternative of putting to death the witness of their treachery? "Dead men tell no tales" and perhaps the general might have escaped the justice of his country a little longer had he adopted the measures of Serjeant Meet for surpressing evidence. But let the guilty tremble, whenever there is an investigation before Congress of the motives of Pike's expedition and the testimony then given will be of more consequences to the nation than the major's journal.

This charge is extremely interesting, although it is impossible to determine whether or not it is true. Further accounts of the above-mentioned murder do not appear in any of the subsequent issues of the *Chronicle.* Coues believes that it was one of General Salcedo's men that Meek killed and not one of Pike's, since the explorer accounted for every member of his party. No Congressional investigation of the motives of Pike's southwestern expedition was ever held except to determine whether he and his men were entitled to compensation by the government, as in the case of Lewis and Clark.[38]

The only mark against Pike's military record

[34] The western newspapers examined in connection with Wilkinson and Pike were: the *Lexington Gazette,* Lexington, Kentucky, 1806–1809, University of Kentucky Library, Lexington; the *Weekly Chronicle,* Natchez, Mississippi Territory, 1807–1812, Mississippi State Archives, Jackson; the New Orleans *Gazette,* New Orleans, New Orleans Territory, 1807–1810, Louisiana State Archives, Baton Rouge.

[35] September 16, 1809.

[36] Italics are mine.

[37] Pike to Caesar A. Rodney, July 24, 1813 (Cantonment Suranac), Zebulon Montgomery Pike's Correspondence, Chicago Historical Society.

[38] In 1846 Congress awarded Pike's widow $3,000 for the two years that her husband was engaged in his two expeditions, 1805–1807. *Public Documents of the United States Senate* IV, 1846.

was when he was arrested and court-martialed in 1811 for conduct not becoming an officer. There is much evidence to the effect that the affair was the work of General Wilkinson's enemies in the army.[39] Pike was acquitted, however. When Wilkinson was court-martialed a few months later, no mention was made at his trial of the expedition into the Southwest in 1806.[40]

The War of 1812 gave Pike the opportunity to obtain promotion to brigadier general. He was one of the youngest generals to participate in the war and was extremely anxious to achieve immediate fame, which he did in the siege of York in 1813. The attack was a success, but Pike was killed. He died a hero's death at the age of thirty-four.

The historian is justified in exposing and convicting a scoundrel and traitor. But most of the evidence against Zebulon Montgomery Pike is circumstantial. For each charge his critics have brought against him, his champions have a logical defense. There are few events in General Wilkinson's military career in which he failed to use every opportunity for personal gain. If his primary motive in sending Pike into the Southwest was connected with the Burr conspiracy, then Pike should have eventually recognized the fact. His failure to do so would indicate that he was either naive, or else that he refused to expose a loyal friend.

An extensive study of the available material still leaves several unanswered questions. Despite the absence at this early date of an adequate focus of public opinion, the various charges in the western newspapers are not to be taken lightly. Frequently, the line between truth and fiction is very thin. If the explorer was guilty of duplicity, it must be remembered that he was carrying out orders of his commanding officer and that private filibustering expeditions into the West and Southwest were characteristic of the era.

In view of his many years of creditable service for his country, his character and ideals as expressed in letters to his family, fellow officers, and personal friends, and the manner in which he died, it is difficult to believe that he would knowingly commit treason. Yet, although Wilkinson was three times acquitted of treason, Pike would have been stupid not to have recognized the man's dishonesty and double-dealing. (One could hardly classify Pike as a dull individual in view of his many accomplishments.) Instead, the young officer remained loyal to General Wilkinson to the very end. Perhaps he was merely being rational. One of his last letters, written a few months before his march into Canada, was to General Wilkinson expressing his deep devotion and friendship, and lamenting the fact that he, the General, had been so abused and misunderstood by an ungrateful people.[41]

The full story of General Pike's life can never be written without his personal papers, which were destroyed by fire in 1894.[42] Some critics will probably continue to accuse him of duplicity, while others will defend and glorify him. An accurate appraisal of the man doubtless lies somewhere between these two points of view.[43]

[39] The *National Intelligencer*, June 25, 1811.

[40] *Ibid.*, February 1, 1812.

[41] Pike to Wilkinson, July 24, 1812, Trenton, New Jersey, Zebulon Montgomery Pike's Correspondence, Chicago Historical Society.

[42] Records of the Pike Family Association, West Newton, Massachusetts.

[43] The author received a grant from the American Philosophical Society for this study.

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